Ahmedabad Janmarg Limited

REQUEST FOR PROPOSAL

FOR

DEVELOPMENT, IMPLEMENTATION, OPERATION AND MAINTENANCE OF INTEGRATED TRANSIT MANAGEMENT SYSTEM (ITMS) FOR BUS RAPID TRANSIT SYSTEM (BRTS), AHMEDABAD FOR AHMEDABAD JANMARG LIMITED, AHMEDABAD

SCOPE OF SERVICES AND TECHNICAL SPECIFICATIONS DOCUMENT

PART – 2

DATE :02/02/2010

Table of Contents

1. INTRODUCTION 4
2. TECHNICAL SPECIFICATIONS OF ITMS 7
3. COMPATIBILITY WITH EXISTING HARDWARE AT VARIOUS LOCATIONS OF AJL 12
4. AUTOMATED FARE COLLECTION SYSTEM 13
5. FLAP BARRIER 23
6. TURNSTILES 24
7. BULK INITIALIZATION MACHINE (BIM) 26
8. CARD PERSONALIZATION DEVICE (CPD) 27
9. HANDHELD TERMINALS FOR TICKET INSPECTION 27
10. OTHER TRANSIT SERVICE PROVIDERS / OTHER SERVICES: 29
11. GPS BASED FLEET MONITORING SYSTEM 29
12. PASSENGER INFORMATION SYSTEM 33
13. WEB PORTAL FOR BUS SCHEDULE & ETA 39
14. BUS TERMINAL MANAGEMENT SYSTEM (BTMS) 40
15. CENTRAL CONTROL SYSTEM (CCS) 41
16. ITMS SECURITY MANAGEMENT 48
17. FINANCIAL MANAGEMENT SYSTEM 49
18. TRAINING ROOM AND TEST AFCS 50
19. CASH HANDLING 51
20. OFF- SITE SALES 51
21. NON-TRANSIT SERVICE PROVIDERS 52
22. HUMAN RESOURCE MANAGEMENT 52
23. AFCS DISASTER RECOVERY CENTRE / BUSINESS CONTINUITY PLAN 52
24. LEAD TIME 53
25. APPLICATION AND SYSTEM AUDIT 53
26. SCOPE OF PILOT IMPLEMENTATION 53
27. CHANGE MANAGEMENT PROCEDURE 54
28. COMPUTERISED CALL MANAGEMENT SYSTEM 55
29. PROJECT MANAGEMENT REQUIREMENTS 55

List of abbreviations used in the document:

AJL –Ahmedabad Janmarg Limited

ITMS – Integrated Transit Management System

SP- Service Provider

SC –Smart Card

AVLS – Automated Vehicle Locator System

AFCS – Automated Fare Collection System

HTU – Handheld Ticketing Unit

BDC – Bus Driver Console

BCV – Bus Card Validator

STT – Station Ticket Terminal

SCV – Station Card Validator

CT – Central Terminus

DMS – Depot Management System

BTMS – Bus Terminal Management System

CCS – Central Computing System

BIM - Bulk Initialization Machine

CPD - Card Personalization Device

MTBF – Mean Time Before Failure

MTTR – Mean Time To Replace

CCHS – Central Clearing House System

GSM – Global System for Mobile communications

GPRS – General Packet Radio Service

GPS – Global Positioning System

BTMS – Bus Terminal Management System

DMS – Depot Management System

1. Introduction

The purpose of this document is to provide guidelines for procurement & implementation of Integrated Transit Management System for AJL, Ahmedabad. The document underlines all IT related requirements of AJL to achieve a highly automated and stable environment for Bus Operations Management in city of Ahmedabad.

Objectives:

With a view to enhance commuter satisfaction, reliability and punctuality of bus operations thereby enhancing the efficiency of AJL's Bus operations and better management of fleet of buses and in order to instil confidence in commuters in AJL's services, AJL is desirous of implementing the "Integrated Transit Management System" (hereinafter referred to as the "ITMS" OR "The Project"). To this end, AJL has decided to monitor the movement of the fleet of buses, collect data related to their geographical position, vehicle movement patterns and to provide relevant information to passengers/ AJL's management besides implementation of Automated Fare Collection System within the said system.

Solution Summary:

AJL envisages implementing ITMS for its city bus operations to bring in world class operational efficiency and automation for its transit operations. ITMS is expected to meet the corporate objectives of enhancing service standards, bring in commuter market approaches, better organization of planning and operations; integration in future with (e.g Ahmedabad Metro, A/C Service Monorail, AMTS, GSRTC and other services like parking etc), integration of control, capital improvements, marketing, and automate collection and payment of transit fares. The AFCS system and other applications within ITMS are expected to be flexible enough to compliment AJL's growth requirements.

ITMS should enable AJL to automate its Financial Characteristics, Operational Characteristics, better insight into Passenger profiles, perform Route Analysis to optimize on operational efficiency, Service Consumption, perform functional area productivity analysis and thereby creating AJL Bus service a user choice.

ITMS shall provide a new set of tools for achieving urban local transport policies. This system shall provide services using modern computing and communications technologies. The system shall collect information about the state of the transport network, process that information, and either directly manage the network (e.g. headway management), or allow people to decide how best to use the network (e.g. incident detection, travel news). ITMS system shall play an important role in delivering policy objectives, including tackling casualty reduction, traffic congestion and pollution, as well as improving accessibility, providing integrated transport solution and making best use of existing infrastructure. The system shall deliver noticeable economic benefits through reduced journey times and increased journey time reliability, as well as improvements in safety and reductions in pollution. The benefits of using ITMS include:

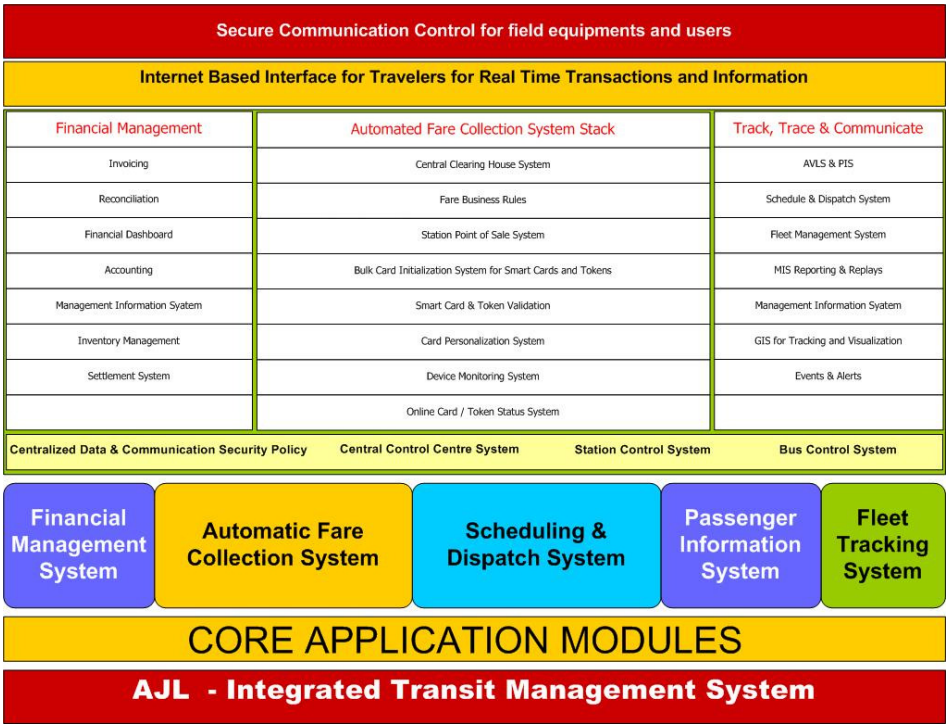
- Making travel more efficient (safer, less polluting, cheaper, better informed travel);

- Helping to achieve 'Best Value' within network management as a result of greater information gathering and improved decision making;
- Simplifying public transport use by providing accurate real time information about services;
- Reducing the number of accidents by providing drivers with more information about conditions on the roads they are using;
- Helping drivers find the best route to their destination, and changing that route if major incidents occur on it;
- Improving the security of public transport passengers and staff by providing extra communications
- Providing immediate information of catastrophic incidents and prompting for immediate response (Accidents, Ticket-less Travel, Law & Order incidents etc).
- Two way communication between control room and crew
- Visual display of inside of a bus/BUS STATION for control room/controllers.

ITMS for AJL shall comprise of following distinct application areas:

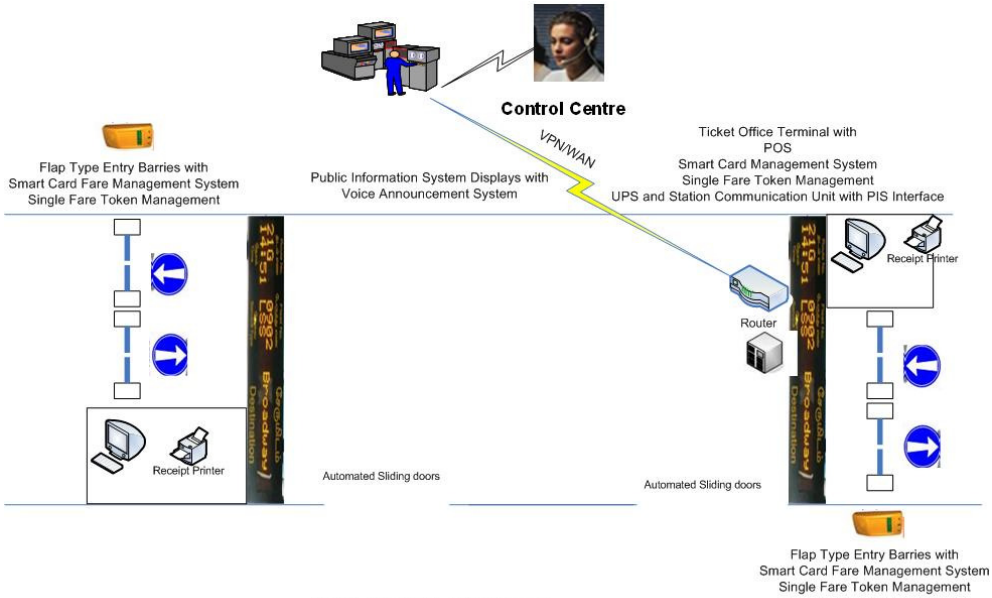
- Automated Fare Collection System
- GPS based Fleet Monitoring System
- Vehicle Scheduling & Dispatch System
- Passenger Information System
- Financial Management System / Central Clearing House System
- Depot Management System

Integrated ITMS Overview



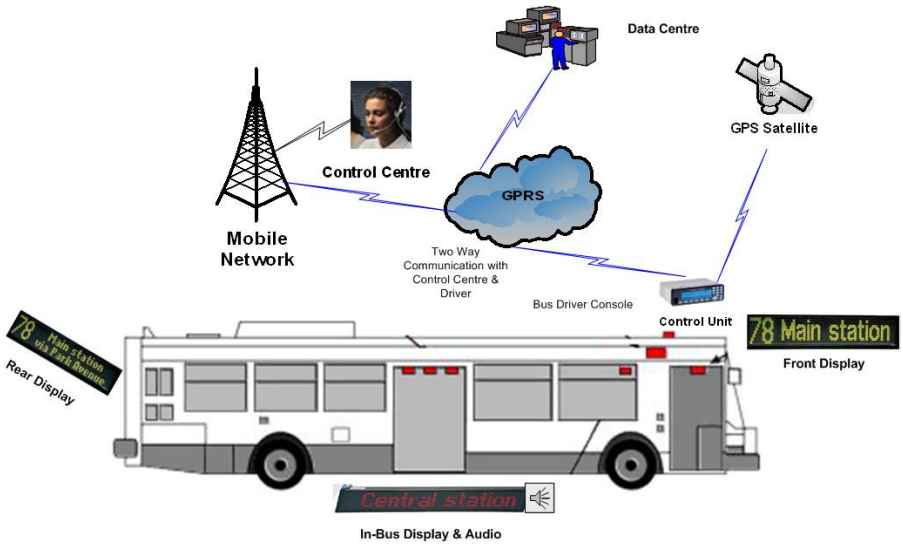
The figure above is indicative and does not include all the activities that would need to be carried out as part of implementation of ITMS. Detailed scope is mentioned in the document below.

1.1. Bus Station ITMS Overview

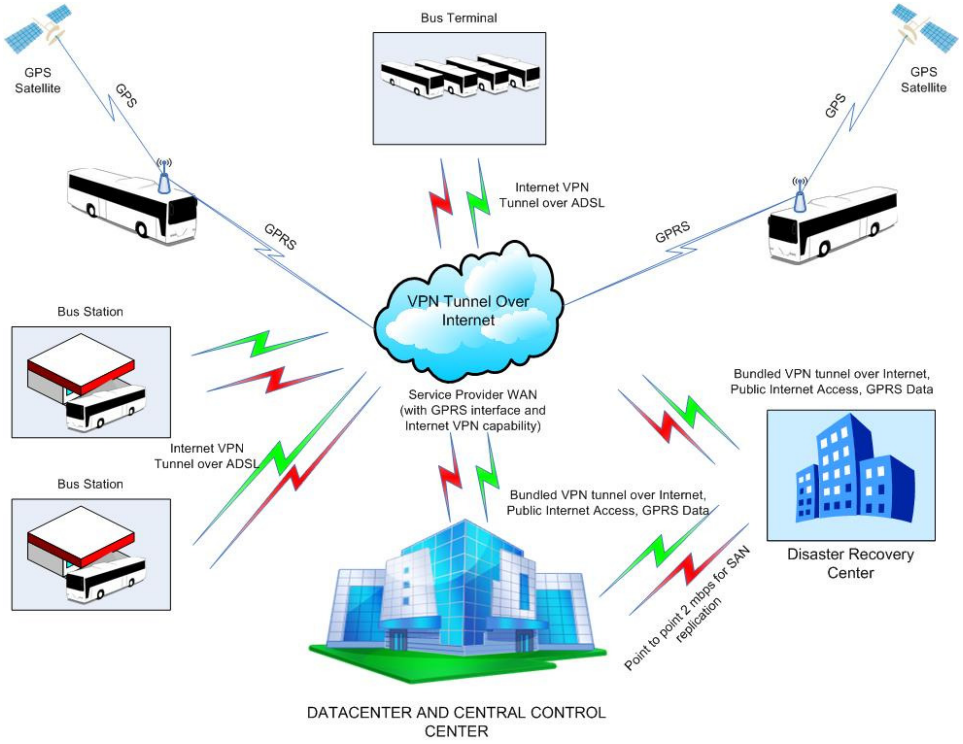


BUS Station Overview

1.2. BUS ITS Infrastructure Overview



1.3. Communication Overview


Bus Terminal
GPS Satellite
GPS
GPS Satellite
GPS
Internet VPN Tunnel over ADSL
GPRS
GPRS
VPN Tunnel Over Internet
Bus Station
Bus Station
Service Provider WAN (with GPRS interface and Internet VPN capability)
Internet VPN Tunnel over ADSL
Bundled VPN tunnel over Internet, Public Internet Access, GPRS Data
Bundled VPN tunnel over Internet, Public Internet Access, GPRS Data
Disaster Recovery Center
Point to point 2 mbps for SAN replication
DATACENTER AND CENTRAL CONTROL CENTER

2. Technical Specifications of ITMS

This following section describes functional specification of different component to be used for ITMS implementation for AJL Limited. The figure below provides conceptual view of the ITMS to be deployed for AJL Ahmedabad.

The technical specification section provides specification for six major IT components for AJL:

- Automated Fare Collection System
- GPS based Fleet Monitoring System
- Passenger Information System
- Vehicle Scheduling & Dispatch System
- Financial Management System / Central Clearing House System
- Depot Management System

NOTE: All hardware equipments supplied as part of ITMS must carry industry standard certifications like U/L, CE etc to ascertain that the equipments have been manufactured and certified based on international standards.

Service Provider shall provide power backup facility at the bus station for at least 4 Hrs.

2.1 Automated Fare Collection System

The Automated Fare Collection system shall be driven by a Central Computing environment which enables the devices and applications to exchange information based on the operational requirements of AJL. The components that shall be used to perform various functions are described as below:

- Station ticket terminal
- Internet based ticketing
- Dealer/ Agent based ticket sale system
- Smart Card/ RFID Single Journey Coins
- Bus Card Validator
- Bulk Initialization Machine
- Card Personalization Device
- Flap Barrier

Station ticket terminal, Bus Card Validator, Access Control System (Flap Entry and Exit Barriers) shall act as the primary sources for fare collection. Smart Cards / Tokens shall facilitate users to pay for the travel using above devices and the smart cards/Tokens shall be made available for dispensing after the cards have been initialized by BIM and CPD.

The fare collection and authentication devices as mentioned above shall communicate with Central Computing environment and Bus Terminal Management System based on the operational requirements of AJL.

The system should have facilities for online issue of passes and delivery of passes. There may be more than one mode of transport & multiple classes of each mode. System for Issue of passes through agents is also envisaged to be part of the AFCS enterprise application.

External Ticketing System should include:

a. Multimodal Tickets
b. Issue of Tickets on web.
c. Issue of tickets by Dealer / Agents
d. Issue of passes Online / Offline
e. Dispatch of Tickets

It is expected that the system hooks transparently to the system of Ahmedabad Metro, other transit modes whenever those systems become operational.

The system is envisaged to operate automated fare collection by way of using contact less smart card, RFID coin tokens and paper tickets. The travellers who own smart card shall be required to use smartcard at flap gates installed on sheltered station and tap on the Bus card validator for trip start. The travellers travelling with coins shall also gain access to the BUS STATION via flap gate authentication and have facility of coin drop on Bus Card Validator.

Smart card system is envisaged to have following characteristics:

- One time issue multiple usage

- Recharge remotely through following modes:
- Internet
- Mobile Phone
- Dealer Recharge
- At ticket counters
- Recharge Coupons

Amount of recharge could be Minimum Rs 10/- with no upper limit

The smart cards shall be valid for travel on AMTS system at a later date, AJL envisages to achieve – One Travel Pass across the city

AJL may offer attractive incentives to Smart Card users

In-order to ensure there are no ticket-less travellers within the system, the service provider shall provide manpower at TB's to monitor entry and exit gates of bus.

2.2 GPS Based Fleet Monitoring System

The Automated Vehicle Locator System (AVLS) shall primarily use GPS devices mounted on the vehicle as primary source of data for tracking purposes. The AVLS shall also facilitate CCS to enable public information system to act as a source of information to be displayed on the public display screens and voice based information. The AVLS shall essentially comprise of following components:

- Bus Mounted GPS based driver console
- Onboard Passenger Information System
- Off-board Passenger Information System
- GIS Based Fleet Monitoring and Control System

The AVLS system shall enable AJL operations team to monitor vehicle movement in real-time and synthesize the AVL field data to deliver the same on the public information system devices installed on Bus stations, Terminals, Buses, AJL customer portal and mobile information delivery system.

2.3 Passenger Information System

The passenger information system shall consist of following units which shall offer customers schedule and real-time information regarding operations of AJL Bus Service and extend ease of information Delivery related to travel:

- Display Screen on Bus Stations
- Display Screen on Bus
- Voice announcement system on Bus
- Web AJL Portal for Bus Schedule & ETA

The display systems at bus stations and bus terminals shall display real-time information of the route and estimated time of arrival using mobile data connection with the central

vehicle monitoring system. The system shall have capabilities to clearly indicate the direction and route no / route colour of the bus on the display to assist passengers.

The bus display units on the front wind shield and the back window shall display bus route information and the internal display shall display real-time information of the stations bus is going to pass through preferably by showing real-time position of the bus on a transit line diagram. The voice information system shall also derive information of the next station based on the location information derived from the GPS unit and shall have capabilities of playing pre-recorded voice information in the bus.

The AJL web portal shall enable passengers to get information about the bus schedules on various routes operated by AJL and shall also have facility to deliver ETA based on the real-time data from GPS central monitoring system. The web portal shall also provide facility to passengers to extract such data through the mobile communication system.

A call centre shall be maintained by the service provider on behalf of AJL for passengers to call into for information on bus routes and schedules as well as for any issues on fare. Call centre shall be able to log in complaints through call centre executive or IVR.

2.4 Vehicle Scheduling and Dispatch System

Scheduling/dispatch software shall be used to aid designing and modifying transit routes. It shall also be used to route, schedule, and dispatch vehicles in demand response operations. The application shall combine GIS and AVL to coordinate different transit functions. Combined technologies such as, computer-aided dispatching and AVL shall increase the efficiency of transit operations, enhance safety, improve service. For example, systems integrating automated scheduling and dispatching and AVL enable a dispatcher to know the exact location and status of each bus under control. This real-time information allows the dispatcher to address any problems with service or to respond to any emergency. In addition, automated dispatching software and AVL allows the coordination of services among many separate transportation agencies.

Vehicle scheduling and dispatching system should be capable of dynamic planning and Capable of optimising 1000s of vehicle movements, the system should be capable of automatic dispatch distribution and transport operations, dynamically rescheduling vehicle and driver assignments based on real-time events.

Real-time Scheduling Systems & Dynamic Planning Software

- Dynamic routing and scheduling of vehicles (including dynamic scheduling of multi-drops or multi-collects and dynamic assignment of work to resources)
- Real time distribution scheduling (last minute orders, variable demand, etc.)
- Efficient fleet and driver usage, taking account of working time directives, shift scheduling, vehicle maintenance scheduling and customer constraints
- Reduced spot-scheduling costs and better utilisation of own-fleet
- Improved service levels, including better adherence to schedule and greater flexibility
- Real time optimization based on operational constraints and business objectives
- Improved visibility at all levels of the operation
- Real time planning in response to last minute orders, cancellations, redirections, etc.

- Advanced warning of potential delays due to traffic congestion or breakdowns, and tactical response.

In an operation where fulfilment windows are very narrow, and penalties for late operations may be substantial, the system should have ability to react quickly to operational problems such as traffic delays, breakdowns, last minute dispatches, etc. The system should allow planners to tackle this problem by re-planning optimally, thus reducing the need for over-resources and spot-scheduling while improving service levels. The user-friendly graphical planning interface should allow fast and effective interaction with the dispatcher & vehicle tracking system through on-screen maps, reports and editors.

The system should be capable of automatically assigning parking berth to the incoming vehicles at the central terminus extending ease of operations to station management and customers.

The System should be flexible enough to accurately model all real time transport operations, and may be configured to exactly match business requirements.

2.5 Financial Management System – Central Clearing House

The financial management system shall comprise of enterprise accounting system & finance management which shall take care of all accounting functions of AJL including fare accounting, disbursal to operations, profit and loss calculations, asset management etc.

The financial management system should also enable AJL to manage fare or any other financial transactions with companies offering services to AJL. It is envisaged to offer single ticket to passengers to travel across all urban transport systems in Ahmedabad and hence the financial management system should have capability to account for all such activities and suitably have function to enable payment receivables and deliverables to respective entities – **Central Clearing House System**.

2.6 Depot Management System

Integrated Depot Management System

This module enables to automate depot Operations, which include workshop management, fuel management, traffic management, vehicle management, and so on. The module shall also cover administrative activities and stores requirement.

Stores & Inventory System

This module shall enable automation of stores and inventory for various items at each depot, workshop, division and so on. The module also covers purchase and procurement processes right from sampling to evaluation of products to tendering to purchases to consumption. It also enables to exchange the information across the depots, divisions and workshops for products availability and requisitions.

Personal Information System

This module covers the various processes related to Payroll and HR activities of Personnel working at Central Units, Divisions, Depots and Workshops. It offers centralized system for better control as well as employee satisfaction.

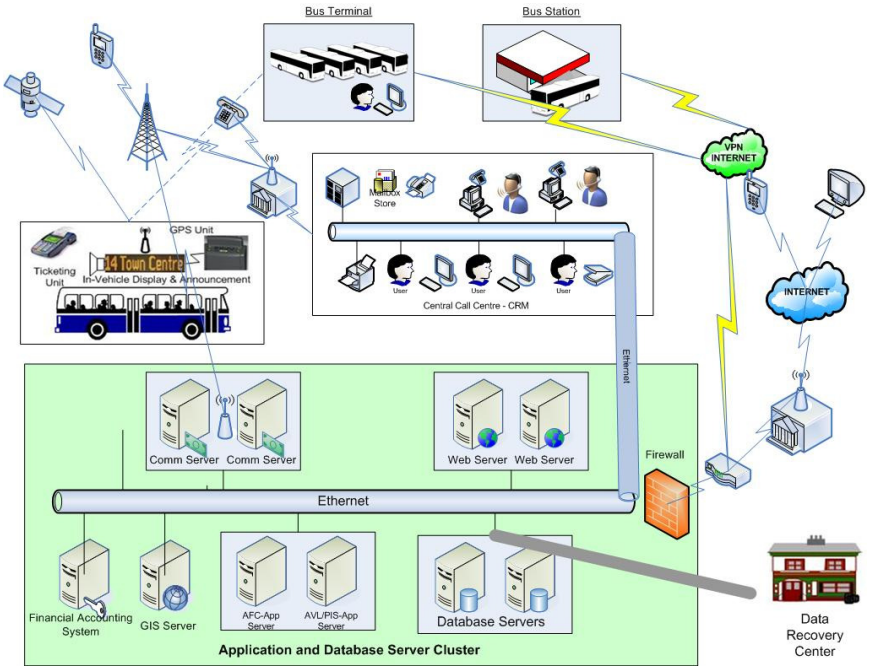
2.7 Functional units of IT system and interrelation

The IT system for AJL operations shall be designed to meet specific needs of following operational entities to achieve the above system needs:

- Central Control Centre
  - i) Central Computing System (AFCS)
  - ii) Central Vehicle Monitoring System
- Bus Terminals
- Bus Stations
- Bus
- Bus Depots

The figure 1 below describes the data exchange model between the individual entities of AJL system.

Conceptual View of AJL ITMS



3. Compatibility with existing hardware at various locations of AJL

AJL is currently having ITS operations in limited scope and certain processes are operational partially like Paper based Ticket issue at Bus Stations, PIS display system at bus stations, PIS display on Buses, GPS based bus driver console on buses and bus card validator.

The service provider shall be required to offer compatibility to the current set of hardware being used with AJL as part of ITMS system. The detailed information about the hardware units in available in Annexure – Current ITS Hardware Assets List

The service provider shall be provided with all the interface protocols and OS details of the current IT assets being deployed in AJL system for the purpose of establishing software requirements for operational purposes.

4. Automated Fare Collection System

The Automated fare collection system shall comprise of all equipments mentioned to perform fare collection process within AJL IT system. The following section describes in detail all the components required for AFCS.

4.1. Smart Card (SC) / Single Fare RFID Tokens

a) Types of Smart Card / Token Applications

The AFCS system shall be capable of deploying **Contact less Smart Cards / RFID Coins and Paper Tickets** for the following basic applications:

- Smart Card for issue to passengers (full fare and concession fares); Capability for Distance based as well as flat fares.
- Smart Card to be used as other pass categories like Police dept etc.
- Other passes such as Daily Passes / Promotional Passes.
- Smart Card for use by the AJL / Operations Team for testing purposes as required by operating and maintenance procedures.
- Paper Tickets and smartcard tickets for passengers travelling on feeder buses operated by AMTS

The system shall issue smart card, which will contain personal information of the passenger, including eligibility for concession, While there can be means put in the system to distinguish different consumers/passengers (e,g Students, / Women / Special Categories etc). The system should be able to read the card, verify the same with the central system and debit appropriate fare. It should also be able to warn the passenger / driver if the card has insufficient balance.

b) Characteristics of Smart Cards / RFID Tokens

- The Smart Card to be used with the AFCS shall be ISO 14443 compliant. The Smart Card to be supplied by the operations team shall be Mifare 1K / Mifare Ultra lite/ Mifare Desfire 4K and shall be fully compliant with ISO/IEC 14443 and other relevant ISO/IEC standards.
- The SC shall have an operating frequency of 13.56 MHz
- The dimensions of the SC shall comply with ISO 7810.
- The resistance of the SC to mechanical stress and chemicals shall comply with ISO 10373.
- All SC used shall be suitable for personalisation of one surface with photo and personal details as required by AJL or for Service providers use.
- Each SC / Token shall have a unique external identification number that is linked to the card's manufacturer supplied internal identification number which shall

not be erasable or changeable. The external number shall be engraved or printed in a non-erasable, long lasting ink. The supplier of the cards shall provide an electronic correspondence list between the internal and the external card number where the two are not identical. The external number shall have a check digit to minimise the possibility of errors on data entry.

The AFCS shall be capable of supporting the use of SC which is suitable for both:

- AJL only applications; and
- Multiple applications including generic electronic-purse and independent applications which can use the platform without competing intentions of the applications provided by AJL.

i) Fixed and Variable Data Encoding

- Fixed data shall be encoded onto Contact less Smart Cards by the Operator prior to issuing. Each Smart Card shall be encoded with a unique identification number, date of entering the AFCS, type, encoding device reference number and other pertinent data that shall not change throughout the life of the Smart Card.
- Encoding on variable data fields shall be carried out by the Validator's and field AFCS devices used by AJL.

c) Validity Checking

- The Contact-less Smart Cards / Coins shall be authenticated by all AFCS devices before the actual financial transactions are initiated in order to check originality.
- AFCS equipments shall be able to check the integrity of the data on the Smart Card / Coins during processing. Smart Card / Coins which are no longer capable of being accurately encoded shall be detected, rejected and blocked.

d) Smart Card Issue

A Contact-less Smart Card / Coins shall be considered issued when a value is encoded on it. This shall process in the following ways:

- Encoding of Smart Card for future off-site sales by authorised agents. Value is encoded on the Smart Card that are then handled with the same security as actual money;
- Encoding of Smart Card for first issue by the Station ticket terminal.

e) Smart Card Security / RFID Coins

- Each transaction of card with any device in the system shall first be security authenticated with exchange of encrypted (with the appropriate application key set) number exchange
- When corrupted or suspicious Smart Card numbers are detected, the numbers shall be added to the blacklist that is downloaded to the AFCS equipment to protect against fraudulent use of Smart Card.

4.2. Automated Fare Collection System

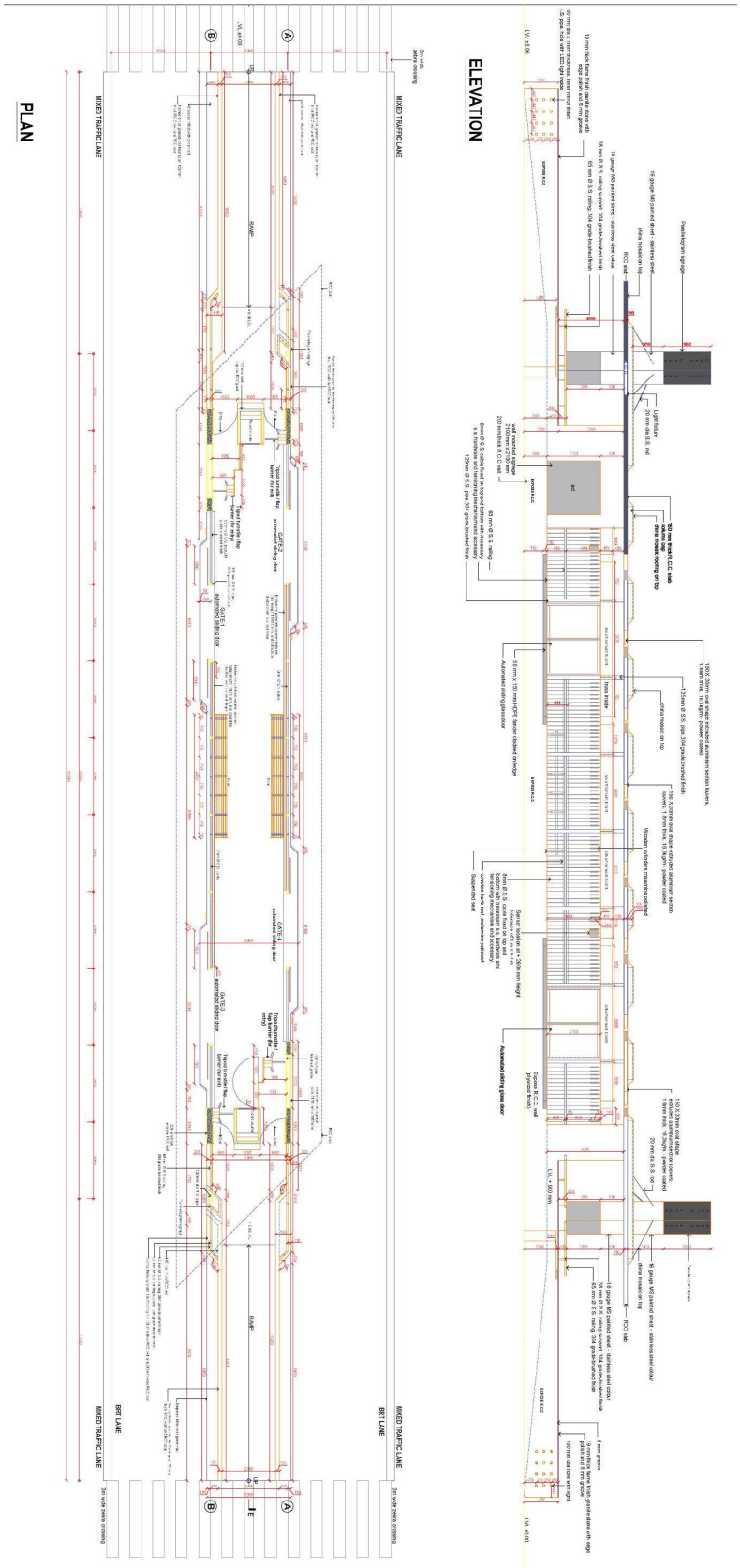
Basic general functional requirements of all on bus devices:

The Equipment supplied shall withstand the harsh working conditions of vibration, heat, dust, moisture, rough usage, Radio interference. The Service Provider shall implement application software [Asset Tracking] to track the devices that are installed in the network using suitable identification methods. This could be possibly done by attaching a RFID Tag to all assets in operation in AJL

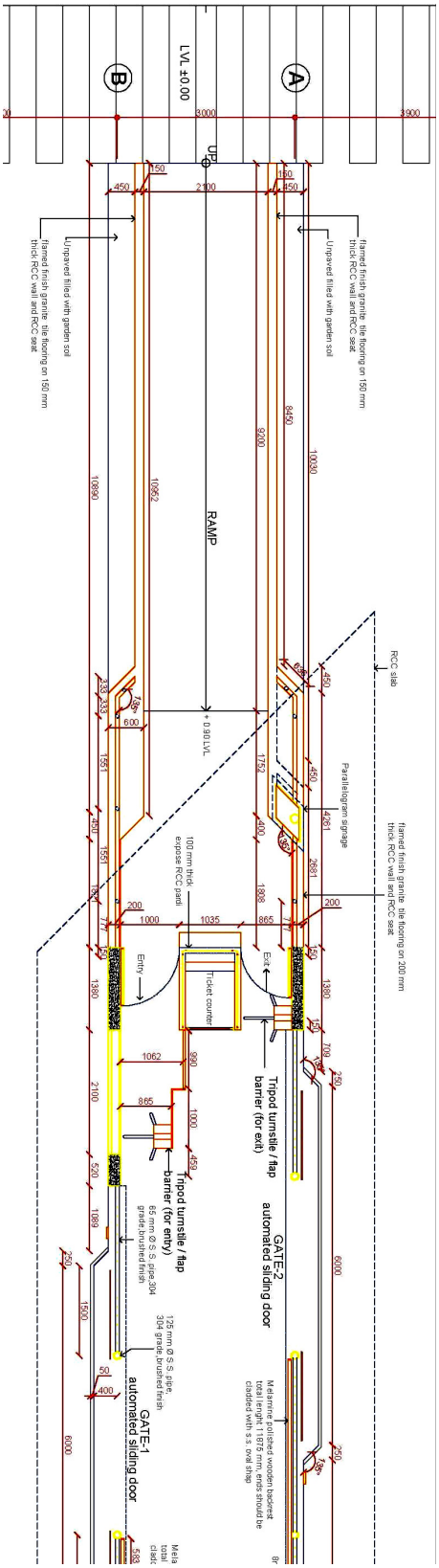
4.3. Automated Fare Collection System - Bus Station / Bus Terminal Devices

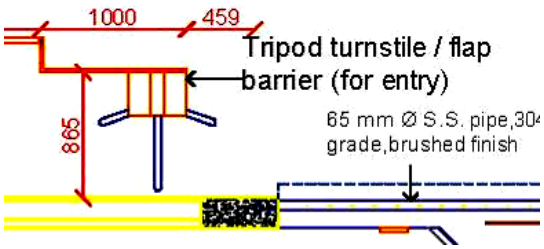
4.3.1. Station layout

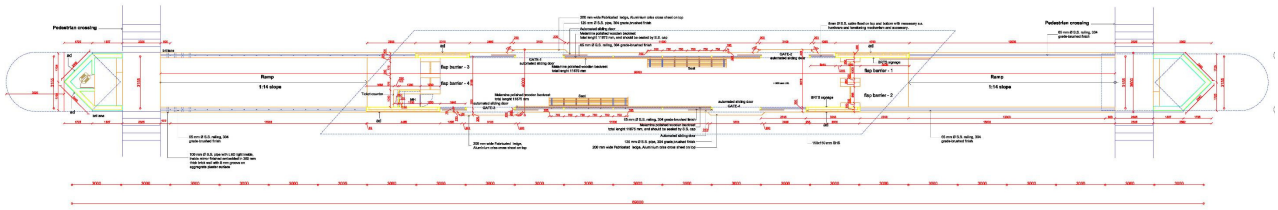
Current Layout 1:


PLAN
ELEVATION
MIXED TRAFFIC LANE
BRT LANE

Current Layout 2

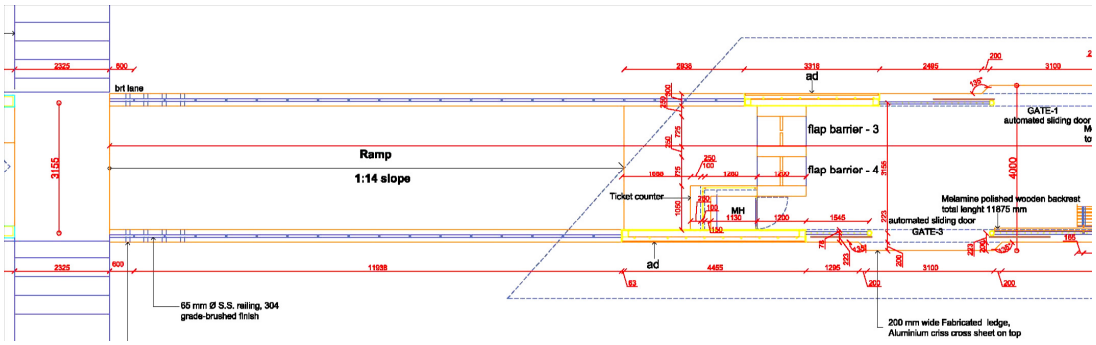




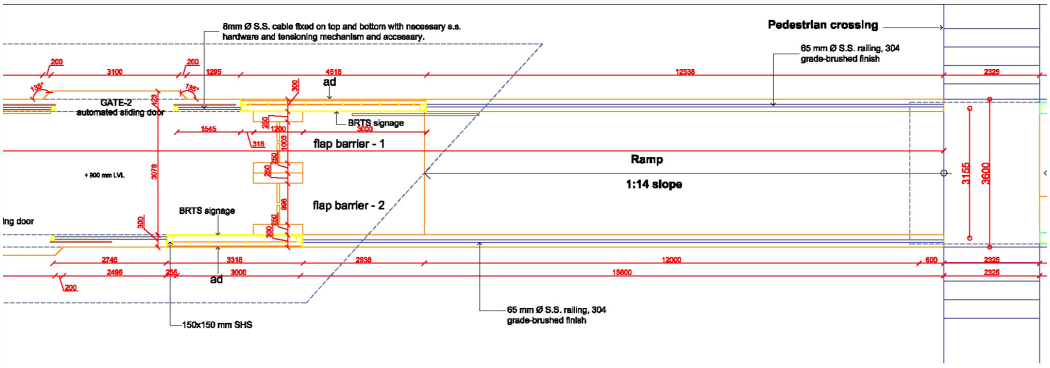


GROUND FLOOR PLAN

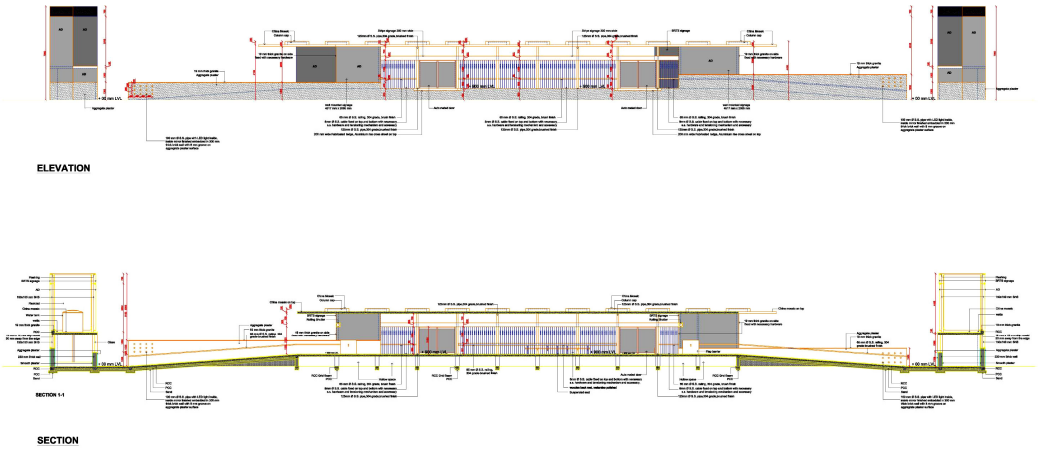
TYPICAL DETAIL PLAN AND ELEVATION OF BRT BUS STOP (Phase 2)



DETAIL B 1 (refer plan above)



DETAIL B 2 (refer plan above) – 1000 mm clearance at flap gates for Access to Physically challenged / wheel chair



TYPICAL SECTION AND ELEVATION

4.3.2. Station Ticket Terminals (STT):

i) Functional Requirements

- The Station Ticket Terminals shall be manually operated, desk mounted units and shall be used to read and write to the Contact less Smart Cards and single journey RFID Coins.
- The STT shall be able to issue with stored value, add value, analyse, and replace all types of deployed SC within AJL system and its participating partners.
- The STT shall be able to perform the above functions in combination on a single SC according to AJL configurable business rules.
- The STT shall consist of a POS terminal with an integrated SC reader and receipt printer. The POS PC should be compact unit, touch screen based for ease of user operations.
- The STT should also be integrated with electronically operated cash vault which is activated through software installed on STT along with physical Key Lock.
- The STT shall not accept a new transaction until the previous transaction has been completed. The display shall time-out after a period defined through its operating parameters at the CCS unless a new transaction takes place before the end of the defined period.

- It shall be possible to request a receipt to be printed for the last completed transaction on the STT but receipt printing shall be on request only and not automatic.
- STT should also have customer display interface for customers to view the ticket transaction data with audio.

ii) Operation of the Ticket Office Terminal:

- The STT shall permit all required functions to be easily accessible to the operator through an intuitive interface that will permit transactions to be completed with the minimum of operator actions.
- The service provider shall modify the STTs operation sequence to meet AJL's requirements, if necessary.
- Irrespective of the automatic selection, the mode of operation shall always be selectable by the operator.
- For the card sale function, the amount of deposit shall be encoded together with the initial amount of travel value or the selected Period Pass values. The STT shall always verify the amount encoded against the value selected by the operator and generate the required transaction record for auditing and updating of the database.
- For the top-up function, the STT shall add the amount selected from the list of available amounts or an amount entered by the operator to the current remaining value of the SC. If the deposit has been used for a fare and the current value is negative, the amount shall be used first to replenish the deposit and then to increase the travel value such that the new remaining fare value will be equal to the amount paid minus the existing negative amount. The STT shall always verify the amount encoded against the value entered or selected by the operator and generate the required transaction record for auditing and updating of the database.
- For the analysis function, the SC to be analysed shall be presented to the CARD READER WRITER. Selected data encoded on the SC shall be read and displayed on the passenger display unit together with error code and the computed penalty or excess fare due, if any. In the case of entry-exit flag mismatch, the amount of the penalty, if any, shall be applied. The payment due shall be deducted from the remaining value or taken in cash and the flag reset to its correct state.
- In the case of a SC having been rejected by entry or exit Validator due to corrupted data, the STT shall be used to analyse the SC. The STT shall read as much data as is possible. If necessary and if this data includes the serial number of the SC, the STT shall interrogate the Central Control System to determine the remaining data associated with the SC as recorded in the CCS database. Alternatively, the operator shall enter the engraved or printed SC identification number to retrieve the remaining data from the CCS. Using this data and operational regulations, the Ticket Office personnel shall use the STT to cancel the rejected SC and issue a replacement SC on receipt of the appropriate payment, if any, which will be valid for use.
- Smart Card with invalid codes as a result of exceeding the period of validity of the card since first issued or since last used shall be analysed and the relevant data

displayed on the STT. If the limit has not been exceeded to the point where the card has been cancelled and removed permanently from the database in accordance with operational regulations, the card shall be re-validated by re-encoding the last used date.

- All penalty amounts shall be determined in accordance with the AJL's business rules and shall be configurable from the CCS. All penalty amounts shall be displayed on the STT even where these have been set to zero at the CCS.
- Refund; card in damaged/ good working condition return shall be handled at STTs. Configured to do so, the refund of deposit and purse shall be as per business rules of AJL. All pass return refund and damaged card refund shall be handled by STT configured to do so.
- STT shall provide interface unit near the STT unit for smart card travellers to check balance and validity related activities at all stations. This interface shall also allow the smartcard holders to update balance on their card in-case they have recharged the same using internet based or scratch card based recharge voucher.

iii) Methods of Payment:

- The STT man machine interface shall be designed to facilitate the recording of payments in cash with future scalability to validate credit card (using third party terminal) and by the receipt of vouchers issued or validated by AJL.
- The end of shift reports shall discriminate between payments made in cash, by credit card and by receipt of vouchers to facilitate the end of shift reconciliation process.

iv) Security

- STT shall be configured for operator identification and access control. The process shall serve to identify operating personnel and record an operator's start and end of duty.
- It shall be necessary for the operator to enter his identification and PIN into the STT before being able to start a shift. It shall not be possible for an operator to start a new shift without having first closed the previous shift.
- Provision shall be made for an operator to break his shift such that access to the system is denied to any other user during this break and the shift will resume on re-entry of the original operators PIN and password. The Service provider may configure a time limit to this break such that the STT will automatically log off the original operator and produce close of shift reports accordingly. After an automatic log off, any operator with a valid PIN and password shall be able to start a new shift on this STT.
- The STT will be enabled to collect payment to a preset amount per day, downloaded by the central system. The STT will be automatically disabled if the amount exceeds the preset limit and upon payment, the limit will be released after proper authorisation from authorised team member.

- Access to the STT for servicing and maintenance purposes shall also require the use of high security access control. When accessed by maintenance personnel, the STT shall only process test SC.

v) STT's Interface to CCS / SC

There shall be a GPRS / CDMA / or fixed Internet data link from the STT to the Central server via AJL's network or via secure internet. This shall carry information on the following (indicative list, not limiting):

- Identification of the operator on duty;
- Faults;
- Transaction data.

The stock registers of the STT shall include, but not be limited to, the following:

- Number of SC issued for each type;
- Value of deposit and travel value encoded on new SC issued by type;
- Number of Period Passes issued by type;
- Total value of Period Passes issued by type;
- Number of Penalty deductions made; and
- Total value of Penalty deductions made.

4.3.3. Station Card Validator (SCV) - Installed on entry/exit barrier

i) Functional Requirements

- The SCV shall be capable of performing a transaction with ISO14443 "Type A" cards / Single Trip Coins as a minimum
- The SCV should read cards at a distance 0mm to 30 mm, but shall not operate at a distance that introduces a risk of unintentional operation(tolerance limit + 10%).
- The SCV shall read, write and verify all required data for the transactions associated with SC to permit the application of all the AJL's business rules and the collection of all records required for the AJL's accounting and reporting purposes.
- Transaction time shall not exceed 300ms for agreed and used types of Contact less cards.
- SCV shall be connected to the access gates installed by AJL at Bus stations and Bus terminals. They shall control the access gates based on the validation process of SC.
- SCV should provide suitable interface to flap/turnstile barriers for operations as defined by AJL
- SCV should have RTC in-built for clock management and should have onboard memory to manage business rules of AJL AFCS requirements.

5. Flap Barrier

5.1. FUNCTION

The gates should provide fare processing ability to ensure that the transport system is only used by fare-paying passengers. It processes the fare media of each passenger wishing to enter or leave the transport system and allows or denies passage through the gate aisle according to the validity of the fare media. The gate can operate either under control of a station computer system or in a stand-alone mode. The barrier mechanism separates the paid zone and unpaid zone and gives an effective compromise between fraud prevention and physical safety of adult, child and handicapped passengers. The physical barriers are automatically opened in case of a mains power or during emergency evacuation.

5.2. SECURE ACCESS

The gate is identified by an electronics tag. Downloading security keys is protected through an authentication process between the gate and its host (optional).

5.3. FEATURES

The different gate operating modes may be set locally or remotely. The modes are:

In service: Entry/Exit/Bi-Directional

Out of service: Out of service/Maintenance/Station Closed/Power Failure

Different fare modes are permitted by the business rules (set remotely or locally)

Business rules, operating parameters and fare tables updated by the central system

5.4. FARE PROCESSING

Fare media are checked for validity and updated in accordance with the business rules and fare tables currently in force

Media acceptable: Mifare 1KB, Desfire 4K and equivalent

Other Media acceptable: RFID Coins

5.5. FLAP GATES

Operate in normally- Open mode or Normally- Closed mode

Contact less smart Card or Token Passenger throughput: 60 passengers/min

Barrier types: Central retractable flaps

Gap between flaps < 50 mm

Flap opening < 0.5 sec

Flap MCBF: > 1,000,000 operations

Consumption: 250VA, 550VA peak

Minimum Clear Passage: 1000 mm

5.6. PHYSICAL CHARACTERISTICS

Integral body type unit made from stainless steel with a brushed finish

Passenger detection by optical sensors

Directional Display by LED Pictograms: Entry or Exit aisles visible up to 10m

User friendly 6.4" color TFT display or LCD display provides clear and logical passenger interface

Invalid transaction warning (alarm and display)

Intrusion and fraud management (alarm and display)

Modular design with ease of maintenance

5.7. ENVIORNMENT

Power supply: 220V ±10% 50Hz ± 2%

Operating Temperature Range: 0 ^{o}C to +50 ^{o}C

Humidity: 20% to 80% (non-condensing)

6. Turnstiles

6.1. SPECIFICATIONS

Main specifications	**Parameter Specification**
Height of turnstile	1000 mm
Aisle width	910 mm preferred (minimum 900 mm required)
Length of turnstile	(short length designs are preferred) 910 mm
Electricity input Voltage VAC Frequency- Hz	230 V AC (50 Hz)
Duty Cycle %	100%
Protection	IP 32 or better

Locking Mechanism	Magnetic / Solenoid
RFID Token	Collector Mechanism

6.2. MATERIAL

- All materials should meet the ASTM standards as set forth by the materials industry.
- Operating mechanism should consist of precision machined, interchangeable parts made out of high quality steel materials. No parts incapable of sustaining wear and tear should be used. All relevant components hardened and surface treated to ensure long life and reliable service. Self centering mechanism should be used in order to automatically return arms to the basic position regardless of force used to pass through the turnstile. Rotation mechanism is cushioned through shock dampening.
- The modular mechanism design to be mounted on a thick steel plate so as to allow rapid maintenance.
- Environmentally friendlier and biologically safer through e-coated surfaces
- The outer cabinet should be constructed from thick steel with stainless steel finish
- The hub should have openings for three arms 120 degrees apart. The hub should be manufactured so as to be protected against oxidation and discolouring.
- Arms fabricated from stainless steel tubing with about 1” external diameter or more

6.3. FABRICATION

- The operating mechanism should consist of a hardened locking assembly and interchangeable precision fabricated parts using high quality steel materials.
- All important sub-assemblies made of machined high quality wear and tear resistant material.
- Self-centering, sealed, maintenance free main bearing supports shaft and ratchet assembly.
- The operating mechanism should contain of all electrical components (including power supply, transformers, reset system and access control interface)
- Stainless steel cabinet has rounded edges and corners with no sharp exposed edges in order to prevent injuries.
- Equipped with a locking mechanism to prevent tampering.

6.4. OPERATIONAL SPECIFICATION

- The locking and unlocking of the turnstile accomplished by use of a low voltage, 12/24 V DC, system. Activation is via a momentary, isolated, normally open dry contact closure.
- Electrical controls provided in both entrance and exit directions. Controls may be failsafe, fail-lock or any combination, in either controlled direction.
- Once a direction of passage is opened, it remains open until the user proceeds through to the other side of the turnstile, and the reset System automatically relocks the turnstile and readies it for the next user. The System shall stay open until the user proceeds through unless an optional time-out relay is used.

6.5. LOCKING MECHANISM

- Magnetic / Solenoid locking mechanism (Magnetic shall be preferred)
- Ultra low noise levels during turnstile operation
- Lower power consumption since turnstiles not to be continuously powered on and turnstiles intelligent to sense any movement (or erroneous presentation of the card) and switch on the power

7. Bulk Initialization Machine (BIM)

The Card Bulk Initialisation Devices shall be PC-based systems capable of initializing SC for use in the AFCS. The device shall be essentially identical in functionality to the STT except that it will not require receipt printer and shall have the capability to initialise cards received from the manufacturer with transport key-security key replacement. BIM shall be connected to the LAN at the Administration Office and shall be set up to enable mass initialization of SC prior to the commencement of full scale SC revenue service. The BIMs shall be located with in the central computing location.

The main function of the initialization process is to replace the SC factory transport keys with the system specific diversified master keys, diversification shall use card electronic number to ensure safety across the system and to format the fixed data fields of the SC depending on their ultimate use and the SC type. The number of SC types and Employee Pass types shall be defined by the Employer during the Project implementation.

The Service provider shall use the configurable file format for the different types of SC, including Employee Passes and Period Passes. Where requested and required the service provider shall provide APIs and Security modules customised for the application to be provided by a third party service provider joining the system in agreement with AJL

The BIM shall have separate audit registers to track the total number of SC initialized by type of SC when operating in the initialization mode.

Cards shall be procured initialised and deployed by the service provider.

8. Card Personalization Device (CPD)

The CPD shall have facilities to receive digital images of user photographs and digital input of user particulars as required for the electronic and physical personalisation of specific user Passes for whom physical personalisation is required. It shall also be able to receive and process custom designed graphics for promotional SC.

The CPD is an extension of to the BIM with the card printer attached to it.

8.1. Card Issuance 10 Points in City for concession & normal smartcard can be issued from any station

The service provider shall provision for setting-up at least 10 different locations within the city to provide concession cards to the travellers which shall include necessary documentation to validate use type and delivery of the same at the required address of the recipient. Normal smartcards can be dispensed at the stations and designated retail delivery points within the city.

8.2. Maintenance Requirements

- Device settings shall be updated including software/firmware updates through transmission via the secured communication network set up by the service provider. For reasons of security, device settings shall not be modifiable by field staff of the service provider/others.
- Any device settings modifications including software/firmware updates as well as business rules such as fare settings, discounts etc shall be done with prior authorization by AJL. A digital log of all changes of settings on each and every device shall be maintained and delivered to AJL.
- Any faulty equipment shall be replaced with a tested unit from the spares maintained by service provider.
- Repair and testing of equipment shall be done at the Service provider's maintenance centre and not at site.
- Only a maintenance engineer with maintenance access card shall be able to access maintenance mode of the device which shall allow the maintenance engineer to diagnose the faults and update the device settings directly, if required.
- A repaired unit shall be tested for full functionality as at the time of initial deployment and certified before it is reinstalled at any site.

9. Handheld Terminals for Ticket Inspection

The service provider shall provide handheld terminals capable of reading contact less smartcard / token for spot checking purposes. The handheld shall read smartcard/token and display card information including last transaction details in-order to ascertain travel details from compliance perspective.

The handheld shall be programmable to include audit functions as desired by AJL audit process. The handheld should be able to store violation data and the same should have capability to communicate to the central control centre.

9.1. Functional Requirements:

The unit shall meet the general functional requirements.

The HTU unit shall have a LCD screen for displaying ticketing process with an alpha-numeric keypad including software configurable function keys next to the display. The HTU should also provide navigation keys, enter, cancel, configurable function keys below display, Power on off toggle button, Wi-fi and other status indication led's.

The Passenger validator display shall have colour LED's for status indication besides audio/visual feedback/alarms.

The readers in the HTU should be able to read cards at a distance range of at least 0cm to 3cm from the reader but shall not operate at a distance that introduces a risk of spurious operation.

The HTU should have capability of GPRS interface. The HTU shall have an 802.11b/g compatible Wi-Fi module connected to an external antenna for data transfer and communication of high volume of data and application down loads to the Bus Terminal Management System through BTMS.

A maintenance engineer with maintenance access card shall be able to access maintenance mode of the device which shall allow the maintenance engineer to diagnose the faults and update the device settings when required.

On-board printer should be able to print penalty tickets.

9.2. Operational requirements:

The unit should have capabilities to link to central control application.

The unit shall have sufficient memory storage to allow 5 days transaction data on a busy route, device configuration data for the depot, maximum of 50,000 black listed card data.

HTU shall be able to store additional configuration sets with designated future time and date for activation to enable AJL to implement changes to fares and business rules on all buses at once.

The print time per ticket should be less than 2 seconds and not more than three key strokes.

The validation & read/write cycle time for smart cards should be less than 300ms.

The reader should read cards at a distance between 0mm to 30mm and shall not operate at a distance that introduces a risk of unintentional operation (tolerance limit + 10%) .

The HTU shall read, write and verify all required data for the transactions associated with SC to permit the application of all the AJL's business rules and the collection of all records required for the AJL's accounting and reporting purposes.

9.3. Interface requirements:

HTU shall use serial ports, hi-speed LAN, WLAN , GPRS or USB communication protocols appropriately to achieve optimum performance.

It should have suitable Wi-fi and GPRS hardware built in to it so that the communication can be established at the terminal to download the data into Bus Terminal Management System database.

10. Other Transit Service Providers / Other Services:

The service provider shall advise AJL on provisions in the Contactless Smart Card data structure to permit other transit service providers to process the AJL SC for transactions with a common transit purse. The service provider shall also assist in the integration activity with other transit service providers.

The service provider shall assist with necessary information required to be presented to the banks in accordance with RBI to obtain regulatory approvals for operations of an e-purse.

The service provider shall assist AJL in preparing technical and operating specifications to be provided to other transit service providers for them to follow to ensure compatibility with the AJL AFCS.

The service provider shall give consideration to integrate the systems later with other mass transit service providers in Ahmedabad and other cities operators and operate the central clearing house.

The service provider shall also design website of AJL and same shall be operated and maintained by the service provider during the tenure of the contract.

11. GPS Based Fleet Monitoring System

11.1. Bus Vehicle tracking device

a) GPS and GPRS based Vehicle tracking unit – Bus Driver Console

The Bus Driver Console shall be installed on the AJL buses. The service provider is required to interface with the on-board computer to take necessary data required for control & operations purposes.

The Driver Console Unit with wireless communication module (based on GPRS/EVDO/Wifi) shall be used to provide vehicle tracking accurately and reliably. The back end system shall be able to produce MIS reports of the vehicle schedule adherence report and operated kilometres by each bus, by route and by fleet of each Service provider. AJL may require additional information to be extracted from the vehicle tracking information logged at the control centre.

The system shall be able to provide on line WEB interface for positioning of the vehicles in the system

The unit shall allow AFCS devices such as handheld ticketing unit and bus card validators to use its GPRS/EVDO communication module as a data path to transmit AFCS data to the CCS.

The unit would additionally have an interface module in front of the bus driver for two way communication, messages to be sent by driver and messages to be sent to the driver from the control centre.

The Bus Driver Console unit has to be mounted on board the bus and the assembly has to be designed in a way that integrates with the dashboard of the bus. The bidder has to provide a design which should be theft proof and cannot be in normal circumstances removed from the bus unless standard technique specified by the bidder is applied.

The bus driver console will act as the sole management console for devices onboard like PIS and AFCS equipments. The BDC shall operate PIS manually in-case of GPS outage.

The BDC shall also interface with following sensors of the bus to enable control centre to have real-time information of bus operations parameters:

Odometer

Temperature Sensor

Oil Pressure Sensor

Ignition

Head lamp/tail lamp

Features of BDC UNIT:
On Board Computer

Casing

Dimensions of unit 328 x 52 x 199 (WxHxD) mm

Memory Capacity

RAM 256 Mbyte

Flash 512 Mbyte –(Extendable if required)

Interfaces

Standard interfaces:

RS485

ELSY

IBIS

2 x RS232

USB

Ethernet (TCP/IP)

Odometer input

WLAN

Audio input/output

1 amplified audio output

6 digital outputs

8 digital/analogue inputs for switches.

2 x CAN

2 x Video/Camera input (PAL or NTSC)

GPS

GSM 2G/GPRS

Driver Interface

Keyboard Four keys for navigation and settings

Display 5.7” colour, graphical (VGA), TFT 640 x 480 pixels, adjustable backlighting.

Dimensions 146 x 1 37 x 30 (WxHxD) mm

Performance

About 1000 mA current consumption at 24 V, less than 10 mA at shutdown.

Supply voltage 12 to 35 V

Operating temperature -20 to +70 °C

E-certified. Tested according to UN ECE Regulation No. 10, ver 3:2008

Functions

ELSY Multiplexing functionality

CAN Interface for Engine & Gear Box Diagnostics

Replacement of control and indication tell tail lamps

Audible and/or visible alert the driver and service staff when malfunctions occur

Handling and storing MP3-files for announcements

Control destination and line number signs

Control interior information display & announcement

Keep track of the vehicle’s position via GPS and distance counting etc.

Communication and interface with other onboard units, e.g. ticket machines, smart card reader, passenger counters, video surveillance

GPS time synchronization

Clock and Date Function

Map applications, navigation and driver guidance

Interface with Back Office for Remote Vehicle Health Monitoring.

Interface for Traffic light priority via data radio and loops

Camera monitoring, e.g. rear view camera

Camera Recording Devise Required Extra.

Antenna (GPS, GPRS,WLAN) Extra Required

City Map not included. Require Maps made for Navigation with the Co-ordinate system WGS84 and the format must be Mapinfo (.TAB) or ESRI (.shape)

Sr. No	Specification
1	**Additional Features**

Sr. No	Specification
	Status LED's to indicate Power, GPS and GPRS status.
	Over the air configuration of parameters.
	Remote administration & firmware update over the air.
	Large Display unit interface for two way communication
	Full Keypad for text interface
	At-least 4 separate panic buttons
	Manual override for PIS Information
	Facility to store route information and related data for PIS
	Audio Interface for two way communication by providing speaker and microphone interface
	Single push button for call to central control centre
	Auto-answer call pick-up from control centre
	The data is transmitted securely in order to avoid intentional intrusion
	Manual announcement option by driver interface through microphone interface connected to bus speakers

The Unit should primarily be able to help central monitoring system to generate minimum of following data points as minimum and at the time of finalization of requirements a comprehensive requirement shall be furnished to the vendor:

- Start Stop
- Begin – End Shift
- Fleet Summary
- Detailed Activity
- Speed
- Fleet Status
- Alerts
- Battery Report
- Unit ON/OFF Report
- Ignition ON/OFF

AJL can request for other reports / data / information as deemed necessary for management purposes.

11.2. AVLS Software:

The software shall be web based and utilizes high resolution digital map to show real-time position of the vehicles. The software shall provide map based tracking and transit route line based tracking of vehicles by the control centre operators. The software is expected to have enterprise capabilities which enables multiple user type to be enabled to carry out various functions like, Alarm Management, Vehicle Schedule Tracking, Speed Management,

Stoppage management, Route replays, bus tracking dashboard etc as a standard functionality. The software shall enable control centre management staff quick decision making capability, which shall be achieved by providing graphical tools for visualization. The software shall enable AJL to drill and analyse information and online data in a multi-dimensional manner. Comprehensive analysis and reporting capabilities are expected to be part of the application delivery which matches the world standard capabilities of AVLS systems.

11.3. Maintenance Requirements

- Device settings shall be updated including software/firmware updates through transmission via the secured communication network set up by the service provider. For reasons of security, device settings shall not be modifiable by field staff of the service provider/others.
- Any device settings modifications including software/firmware updates as well as business rules such as fare settings, discounts etc shall be done with prior authorization by AJL. A digital log of all changes of settings on each and every device shall be maintained and delivered to AJL.
- Any faulty equipment shall be replaced with a tested unit from the spares maintained by service provider.
- Repair and testing of equipment shall be done at the Service provider's maintenance centre and not at site.
- Only a maintenance engineer with maintenance access card shall be able to access maintenance mode of the device which shall allow the maintenance engineer to diagnose the faults and update the device settings directly, if required.
- A repaired unit shall be tested for full functionality as at the time of initial deployment and certified before it is reinstalled at any site.

12. Passenger Information System

Passenger Information System hardware shall consist of LED based display system for bus stations, Terminals and Buses. Following are the technical specifications for the display units. The passenger information system shall comprise of following components:

- Display Screen on Bus Stations
- Display Screen on Bus
- Voice announcement system on Bus
- Web Portal for Bus route Schedule & ETA
- Mobile Schedule Access System

12.1. PIS at Bus Stations and terminals

LED display screens that provide sufficient visibility in broad daylight condition shall be installed at AJL bus stations and terminals. There shall be two displays per station. They shall display route and estimated arrival time (ETA). They may also be used to display public service information.

The display shall receive encoded information of route and ETA from the AVTS control center through the common wired/wireless communication link set up at each bus station as part of the AFCS system. The displays must have the ability to decode the information received from CCS and display appropriate message on the screen.

12.2. PIS - Next Bus / Bus Color / Time

PIS display system shall display the next arriving bus with its colour code, transit line and time.

12.3. PIS Display Detailed Specification

Outdoor Passenger Information Sign (PIS), automatic electronic Passenger Information Display Sign System shall be furnished and installed at a Bus Shelter or enclosure provided by AJL. The System shall consist of:

12.3.1. Outdoor Sign

14 rows x 72 columns Amber or Sterling LED are; display height minimum 4.2 inches, display width 28”

12.3.2. Amber LED’s

- Super Luminosity LED made of AlInGaP II material
- Diffused lens
- 3.9mm x 3.4mm oval lens
- Wide viewing angle 130 degrees side to side/65 degrees from center
- Typical intensity of 770 mcd at nominal drive of 20 ma.
- Typical wavelength of 590 nm

12.3.3. Sterling LED’s

- High Luminous Output Sterling LED made of InGaN material
- White Diffused lens
- 3.9mm x 4.0mm oval lens
- Wide viewing angle 130 degrees side to side/65 degrees from center
- Minimum luminous intensity of 1500 mcd

The entire display area of all signs should be readable in direct sunlight, at night, and in all lighting conditions between those two lighting extremes, with evenly distributed illumination appearance to the un-aided eye in all conditions.

12.3.4. Display & Display illumination

All sign displays shall consist of pixels utilizing High Intensity Light Emitting Diodes (“LED”), for superior outdoor environmental performance, of superior UV resistant Epoxy lens and superior resistance to the effects of moisture. Each pixel shall have a dedicated LED for illumination of that pixel in all lighting conditions. The sign system shall have multi-level intensity changes, which adjust automatically as a function of ambient lighting conditions. There shall be no requirement for any fan or any specialized cooling or air circulation.

This LED shall be mounted such as to be visible directly to the observer positioned in the viewing cone, allowing for full readability 65 degrees either side of the destination sign centerline. The LEDs shall be the only means of illumination of the sign system. The LED illumination source shall have an operating life MTBF of not less than 100,000 hours. Each LED shall not consume more than 0.02 Watts.

The characters formed by the System shall meet the requirements of the Americans with Disabilities Act (ADA) of 1990 Reference 49 CFR Section 38.39, or similar international standard pertaining to readability by the visually impaired community.

12.3.5. Sign Enclosures

All Outdoor Passenger Information Signs (PIS) shall be enclosed in a manner such as to inhibit entry of dirt, dust, water and other contaminants during normal operation or cleaning. Entry to the enclosure is from the front window side of the enclosure allowing an ease of maintenance/replacement. Service personnel do not have to remove the sign from its mounting bracket or from a wall in order to repair/maintain the device. Access to the inside of the sign is through the use of special tools. Use of the Torx tools and hardware maintains the tamper resistant nature of the Outdoor PIS, making it difficult to vandalize. The enclosure shall be made of Aluminum 6063 so as to maintain high strength and rust resistance. All assembly screws are made of stainless steel, which makes them rust resistant as well. The Outdoor PAS should be tested up to IP 54. The IP Code (or International Protection Rating as defined in international standard IEC 60529).

12.3.6. Electronic System Requirements

All electronic circuit boards used in the Sign System shall be conformal coated to meet the requirements of military specification MIL-I-46058C. All Sign System light board components shall be certified to have been subjected to a "burn-in" test of a minimum of twelve (12) hours operation in a temperature of 140 degrees F. prior to final inspection.

12.3.7. Sign Readability

The Outdoor PAS message shall be readable by a person with 20/20 vision, from a distance of not less than 110 feet. The Outdoor PAS shall have a viewing cone of equal readability at 65 degrees on either side of a line perpendicular to the center of the mean plane of the display. The intensity of the illumination of the display pixels shall appear, to the naked eye, to be approximately uniform throughout the full viewing cone.

12.3.8. Talking sign option

The Outdoor PIS should be capable of announcing next bus arrival. The controller board should utilize a 2-channel audio amplifier (rated at 7Watts output) to drive a single 52mm speaker (88 dBA at 2W Input).

12.3.9. Communications

The Outdoor PIS should communicate via the Internet to Automatic Vehicle Location (AVL) Client Workstations and AVL Servers at AJL. At the sign level, information should be processed through the controller board to the onboard modem (GPRS/GSM, EVDO/CDMA/1XRT).

12.3.10. Shelter Lighting option

The Outdoor PIS should be capable of lighting the bus shelter/enclosure with additional LED light modules mounted to the bottom of the Outdoor PAS. When configured, the internal controller board will power five LED modules line on the underside of the sign to provide illumination to awaiting passengers below the sign. Each module is rated at 0.48 Watts and provides 300 LX (luminous emittance).

12.3.11. internal antenna

The Outdoor PAS should have an internal antenna that cannot be damaged during shipping and cannot be tampered with as it is inside the assembly of the sign. The dual band (900/1900 MHz) antenna strip should be of Unity gain, 50 ohm, 5 Watt covert antenna that is protected by tamper proof endplates. It should plug directly into the internal modem (GPRS/GSM, EVDO/CDMA/1XRT).

12.3.12. Power supply options

The Outdoor PAS can be powered by Alternating Current (AC) or Direct Current (DC). AC options are 120 volt (50/60 Hz-3 Amp. max) or 240 volt (50/60 Hz-2 Amp. max). If a solar powered option is used the sign will utilize 12 or 24 volt input. The solar panel is also optional. Power input to the signage should be done with a single opening, liquid tight connection on the rear of the sign.

12.3.13. remote maintenance and diagnostics

The Outdoor PIS should have ability to send updates to the server providing sign status. Firmware updates and IP configurations should also be done remotely via the wireless connection.

12.4. PIS on bus

Passenger information system on bus shall function as an independent system and shall not be directly dependent on the CCS. They shall receive display information and voice announcement commands from the onboard GPS vehicle control module based on stored memory on the bus. The Buses are pre fitted with PIS Display units and service provider shall provide interface and communication mechanism to drive the business process.

Specifications of PIS units to be installed on bus:

Electronic route Destination display system

Alphanumeric Dual Display Technology coloured LED based electronic route display system of high intensity illumination with automatic brightness control along with audio-video display system in English and Hindi shall be installed at the front and side of bus as per the following details.

Front Destination Board

There shall be display of destination with options in Gujarati, Hindi & English along with route number. The display system should be accommodated within the minimum size specified in the bus code. The display should be fixed type. The pitch of the LED shall be optimized to cover the maximum possible area along the length for displaying maximum number of letters. The display shall be clearly visible in all weathers at a distance of up to 50 meters.

Side Destination Board

There shall be scrolling display of destination in Hindi & English alternatively along with fixed route number.

Simultaneously the route number and destination shall be announced so as to be audible to the passengers on the bus stop. The system shall be operated with inbuilt software for above purpose to enable the driver to change the destination at each bus stop. The system shall also be compatible with GPS/any other ITS device whenever fitted. Loudspeakers integrated and synchronized with the display system be fitted one at the front gate and another speaker at the rear gate. The display system be accommodated within the minimum size specified in the bus code. The pitch of the LED shall be optimized to cover the maximum possible area along the length for displaying maximum number of letters. The audio messages and the video display shall be clearly audible/ visible in all weathers at a distance of 5 up to meters.

Rear Destination Board

Inside Display Board (behind the driver partition)

There shall be display of name of approaching bus stops in Gujarati, Hindi & English alternatively duly synchronized with announcement system. The system shall be operated with inbuilt software for above purpose with provision available for driver to display at each stop. The system should be compatible with GPS/any other ITS device whenever fitted. The system should be able to store onboard up to a minimum of 100 messages of 50 characters each on an average. The messages should be capable of rolling, flashing (fully or selectively) in Hindi /English/symbols as per pre-programmed system. The message shall be visible to all the passengers standing/sitting up to the last seat of the bus. The micro-processor based announcement shall be made for both current and next bus stop/destination synchronized with the display alternatively in Hindi and English. The illumination system will be of module display type. The display size of one row shall be 800 mm x 100 mm. The display panel shall have multiple rows for higher coverage. The display shall be mounted behind the driver at an appropriate height for clear visibility to all passengers in the bus from all angles. Present and next stop details shall be highlighted with flashing in modern different commuter-friendly colors. The display time, frequency and sequencing of advertisements/ messages shall be program controlled. The display system shall have the provision of flashing/ highlighting information in pre-programmed mode and through an intervention by the driver/conductor.

The system shall have a programming for minimum 15 numbers of routes and 30 numbers of destinations. Further the system shall also have a programming for minimum 50 nos. of bus stops on each route. The system shall be GPS/any other ITS device compatible. Provision shall be made at a suitable location for the fitment of GPS box/ITS device so that a suitable GPS/ITS device could be installed in future. There shall be provision for feeding more destination options against any route number. The periodic operational interventions of the system by the drivers shall be made through touch type/or any other input device located on the dashboard/near it. There shall be single point near dashboard for changing programme. The system shall be of rugged construction, vibration proof, and water proof and shall be able to operate efficiently at ambient temperatures of approximately 0 degree to 50 degree C, humidity level 5% to 100% and dusty conditions of Ahmedabad urban area.

Integrated voice announcement system

A noise free integrated voice announcement system of adequate volume (which could be heard by all the bus commuters (4 watt, 2 nos.)) shall be fitted one at the front (behind the driver along with LED display) and one at the rear side-inside.

Two more speakers for exclusive use of the passengers outside the bus, especially for the persons with disabilities shall be fitted - one speaker mounted on/near the front gate along with LED display and the other on/near the rear gate.

Synchronization of voice messages / announcements with the visual displays is essential.

Control Panels shall have the following features –

Easily operable, robust, water & dust proof, control switches/keys/touch type within easy reach of driver.

Control Panel layout and content shall be simple and easily comprehensible by crew who is not highly educated. The displays should have all weather visibility.

Crew access to the requisite information by operating least no. of robust buttons / switches / keys.

Console to have over-riding provision to jump the information operation sequence like skipping a particular stop, etc.

Mechanism/port etc. be provided to load/amend/upgrade on-board stored data from PC at the workshop office complete with any related software interfacing hardware required.

Memory storage, retrieval, amendments, additions, deletions etc.

A microprocessor / controller with adequate memory to store minimum 15 numbers of routes (alphanumeric characters) and 30 numbers of destinations with 50 stops each on an average.

Easy and quick retrievability of the all the memory whenever required.

Easy accessibility to microprocessor / controller by driver / conductor from his seat inside the bus.

Provision for upgrading / modifying the existing information as well as additions and deletions.

The size, quality, robustness etc. of the microprocessor / controller be such as to accommodate the entire information required for this system including that required in flashing advertisement messages.

All information pre-programmable and loaded on to the micro-controller through PC.

Ability to retain the entire data in memory in the event of power failure or any other kind of failure in the system be provided.

General Requirements

The system be designed such that data can be fed on-board using add on devices like pen drive etc.

The system hardware should be able to withstand the fluctuations in climatic conditions, battery power, noise and vehicle vibrations, etc.

All the items / sub-systems be leak proof and shall have water / dust ingress protection as per IP Protection No. 55/65 or latest standards.

Mounting of the system should be robust and vibration absorbing type.

The system hardware should be durable and vandal-proof from inside as well as outside the bus (proper protection with locking system be provided).

Excellent visibility from all sides during day, twilight and night in all weathers.

Ability to withstand acceleration up to 10G.

Ability to withstand variation in natural frequencies in the range of 5 to 50 Hz.

The system should have PC interface facility.

It shall be operable on 24 Volt DC power obtained from vehicle battery. The system shall have adequate measures to ensure appropriate quality of power supply even during battery output fluctuations.

All components, circuitry, cards, microprocessors, switches / keys should have ISI marks and be of internationally reputed makes / brands.

All components shall carry ISI mark as far as possible.

The system should have easy maintainability / repair-ability.

It should be damage proof on account of power fluctuation and should continue to operate smoothly even during such fluctuations.

Any other precaution / measures required for smooth and efficient trouble-free functioning of the system year after year for up to the life of the vehicle be incorporated.

The above systems have provision to be upgraded as and when required in future.

Bus architecture should be compatible with ITS components. Adequate arrangements should be made inside the bus for various fixtures to be retrofitted at the later stage like:

- GPS/GPRS vehicle location module
- Driver to control centre communication module
- At-least one LCD screen behind driver's seat
- Ticket vending machines/smart card validators etc.

a) Voice Announcement system on Bus

The Voice PIS must play clearly audible pre-recorded voice announcements informing passengers of next bus station on route. The voice PIS shall interface with the on-bus GPS module to gather location information and making the appropriate next station announcement.

13. Web Portal for Bus Schedule & ETA

AJL's web portal shall extend capabilities to passengers to download route information, route schedule and real-time ETA from the web portal. This information must be accessible using WAP enabled mobile phones also.

SLA for availability of the Web Portal for citizen should be 99%.

13.1. Maintenance Requirements

- Device settings shall be updated including software/firmware updates through transmission via the secured communication network set up by the service provider. For

reasons of security, device settings shall not be modifiable by field staff of the service provider/others.

- Any device settings modifications including software/firmware updates as well as business rules such as fare settings, discounts etc shall be done with prior authorization by AJL. A digital log of all changes of settings on each and every device shall be maintained and delivered to AJL.
- Any faulty equipment shall be replaced with a tested unit from the spares maintained by service provider.
- Repair and testing of equipment shall be done at the Service provider's maintenance centre and not at site.
- Only a maintenance engineer with maintenance access card shall be able to access maintenance mode of the device which shall allow the maintenance engineer to diagnose the faults and update the device settings directly, if required.
- A repaired unit shall be tested for full functionality as at the time of initial deployment and certified before it is reinstalled at any site.

14. Bus Terminal Management System (BTMS)

Each bus terminal is a logical end of a bus route. Bus terminals, for most purposes, are large bus stations from AFCS perspective. In addition to functioning as large bus stations where passengers enter and exit the system, they shall have the following functions.

a) The BTMS will receive data packets from the bus devices and information relevant to the terminal system, and transmit the same to the Central Control System at the end of the shift, business day or at regular intervals as required and configured in the system. The communication speed shall be suitable for the significant size of data exchanges between BTMS and CCS. The transaction data received from the all the devices shall be authenticated before accepting the data. The data despatched to the CCS shall be packaged and encrypted to ensure detection of data tampering.

b) Basic characteristics of the AFCS shall be that of self sufficiency. In the event that a BTMS fails to be operational, each bus on-board equipment suite shall be able to operate autonomously without loss of data for at least 5 days in the pre-configured routes of a depot. When the relevant BTMS becomes operational after a failure it shall be automatically updated with data from the on bus equipment connected to it.

c) BTMS shall have the capability to upload information over secured wired/wireless connection onto the bus equipment, if necessary, if the wireless connection between the bus and CCS were to fail. However, under normal operating conditions, it is expected that all updates to equipment on bus shall be delivered to them through wireless channels directly from CCS and not from BTMS.

It is expected that a large central terminus will be constructed and that this central terminus will become the originating/terminating point for all the bus routes. If and when this central terminus is setup, the service provider will be required to install and maintain all information systems and other facilities that have been enumerated in this document in the above section.

The cost and setting up these systems shall be negotiated at the time the CT will become operational, however the service provider must be prepared to actively participate in the design & commissioning of the central terminus.

15. Central Control System (CCS)

15.1. Functional Requirements

The Central Control System shall generate the necessary management reports from all transaction information received from the AFCS field equipment.

The CCS shall manage, update, hold and upload Configuration data (SC parameters and fare table information) to all field AFCS equipment.

The CCS shall automatically collate all transaction data; authenticate security features of transaction data from the AFCS to provide secure and accurate audit and traffic statistics for the Buses / Routes of the depot.

There shall be a data link between the Card Initialization and Personalization Devices and the CCS such that the CCS shall control all operations performed by these centrally located devices. The CCS shall allocate encoding and validity dates and other information required for the encoding of fixed data on SC and shall monitor and record all operations performed by the devices.

The Central Control System shall provide integrated console management for vehicle tracking and alerts management

The system should be able to provide Decision Support System to the control centre managers to dynamically manage despatch and scheduling system

15.2. Revenue Collection integrity

AJL shall conduct a thorough sanity check on the final released/ deployed ITSM platform to ascertain revenue collection integrity. The service provider shall be required to go through an authorized change management or upgrade request in order to change any parameters on the system. The service provider shall also provide a day end reconciliation reporting application to AJL which shall have access rights only to AJL authorized persons only. The modification to this system shall be allowed only through authorized process. The service provider shall also provide log to ticketing activities as is generated by the fare collection devices directly to the AJL audit system so as to allow AJL to independently review revenue integrity.

15.3. System Description

The Central Control System shall collect data in from each AFC system at Bus station/ Buses / Bus Terminals and process the data to provide overall audit, statistical and operational information by start of next day.

The Central Control System shall poll download only for certain required data in real time (due to any band width limitations in GPRS) from all the equipment through an online server to enable on line reports and information like Vehicle Tracking, black listing and faults.

The service provider shall consult with the AJL on proposals for the type and range of operational, maintenance and financial information to be prepared. The final content and format of presentation of processed data shall be discussed and finalised with AJL.

The operator interface to the CCS shall facilitate the preparation of ad hoc reports and shall permit both scheduled and ad hoc reports to be produced with data corresponding to user selectable short time periods within an operating day.

The service provider shall provide sufficient number of CCS workstations to facilitate finance, audit, engineering, operations and maintenance functions.

A hierarchical Access control system shall be incorporated across the system to ensure that persons can only gain access to the information or facilities that are relevant and authorised to their specific job.

The CCS shall be capable of connectivity with various suitable communication service providers providing GPRS / CDMA / fixed line connectivity through leased lines. All communication networks shall be set up, managed and maintained by the service provider through appropriate contracting terms with communications service providers.

The CCS shall be protected by appropriate fire walls from external access and outside world connections.

The data transferred from the field AFCS to the CCS shall include, as minimum, information such as usage of various equipment, number and cash value of all types of SC issued and topped up, on bus revenue, STT shift revenue, fault reports and passenger origin and destination traffic data, SC type and period pass type and time of day.

The CCS shall have facilities to generate, update blacklists for SC and Employee Passes and to download these lists to the station and on bus equipment. Where the devices are on line either through wired broadband or mobile wireless data connection, these lists shall be downloaded immediately.

The CCS shall download configuration data to the AFCS equipment through BTMS/Depot Management System/Over The air for updating. The information shall include system parameters, card parameters, device parameters the fare tables, validity times for SC, date and time synchronisation, sub-system application updates, of SC and employee identification number and password updates.

The CCS shall be able to support SC replacement and refund (online only) applications from designated full function STT devices and from terminals located in the Administration Building. If a SC is corrupted, the operator shall input its engraved or printed card identification number to retrieve the remaining value of the SC, and the recent usage. It shall also provide printing functions on the details of any selected SC that is stored in the CCS with levy of approved fees.

The CCS shall be designed for autonomous operation of the various components of the AFC system to ensure that a failure in any one component of the AFCS shall not disrupt the system as a whole.

The CCS shall also provide fallback facilities, in the event of prolonged communication failure with the AFC systems. Such facilities may include updating on bus equipment via communication channels set up at Bus terminals and other means for Bus station equipment.

Depot configuration data files on the CCS shall be copied onto a backup media and hand carried to the Depots for Bus AFCS devices, if necessary.

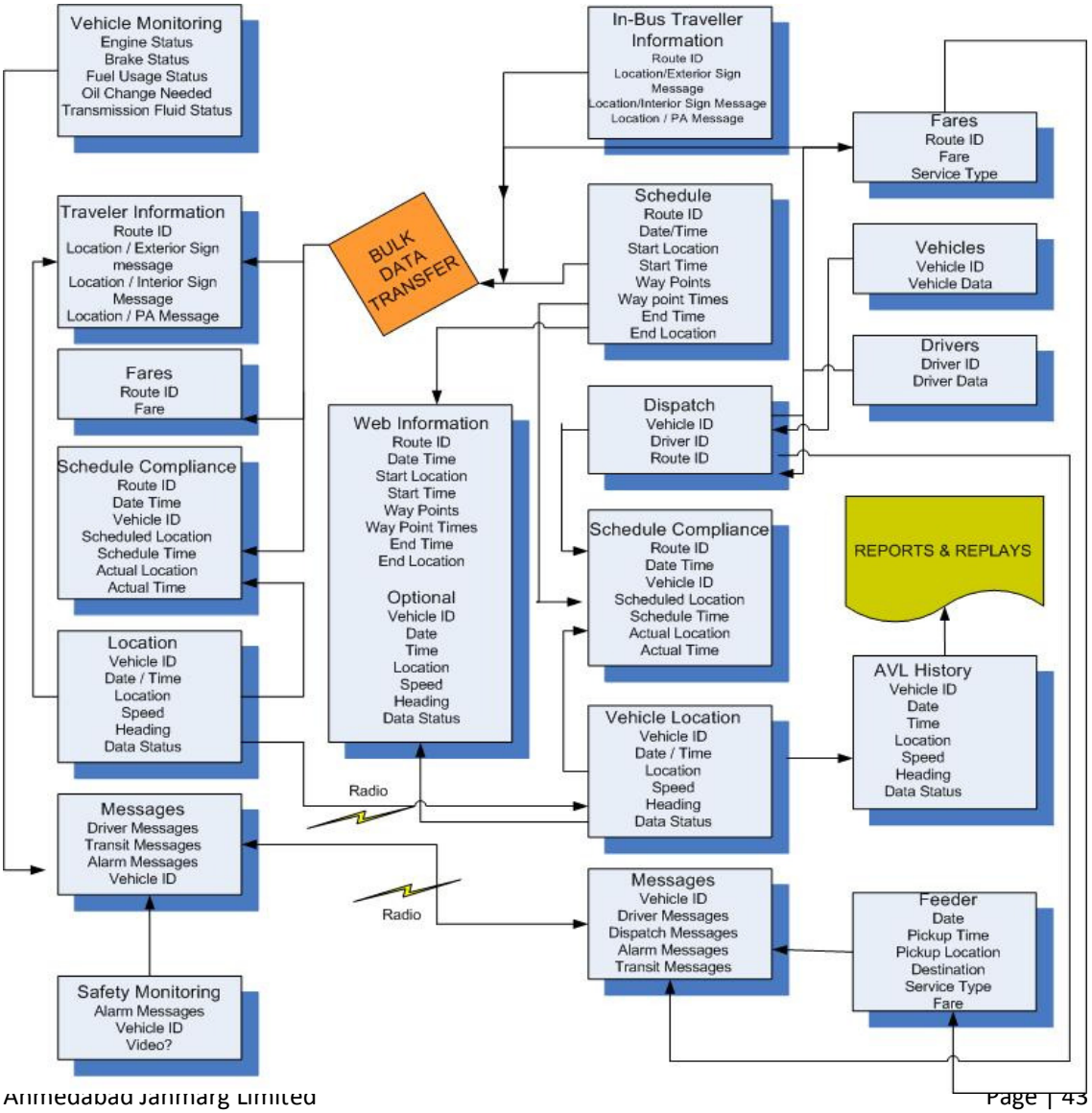
The service provider shall set up a Disaster Recovery System. A different physical site shall be provided by AJL to the service provider to set up and manage the Data Recovery System.

The system provider shall create a visual tracking space on the wall using LCD/Plasma displays of appropriate sizes to enable control centre staff to monitor different tracking activities. This shall include and not limited to vehicle tracking console, Alerts console, Violations Console, Trip summary Controls etc.

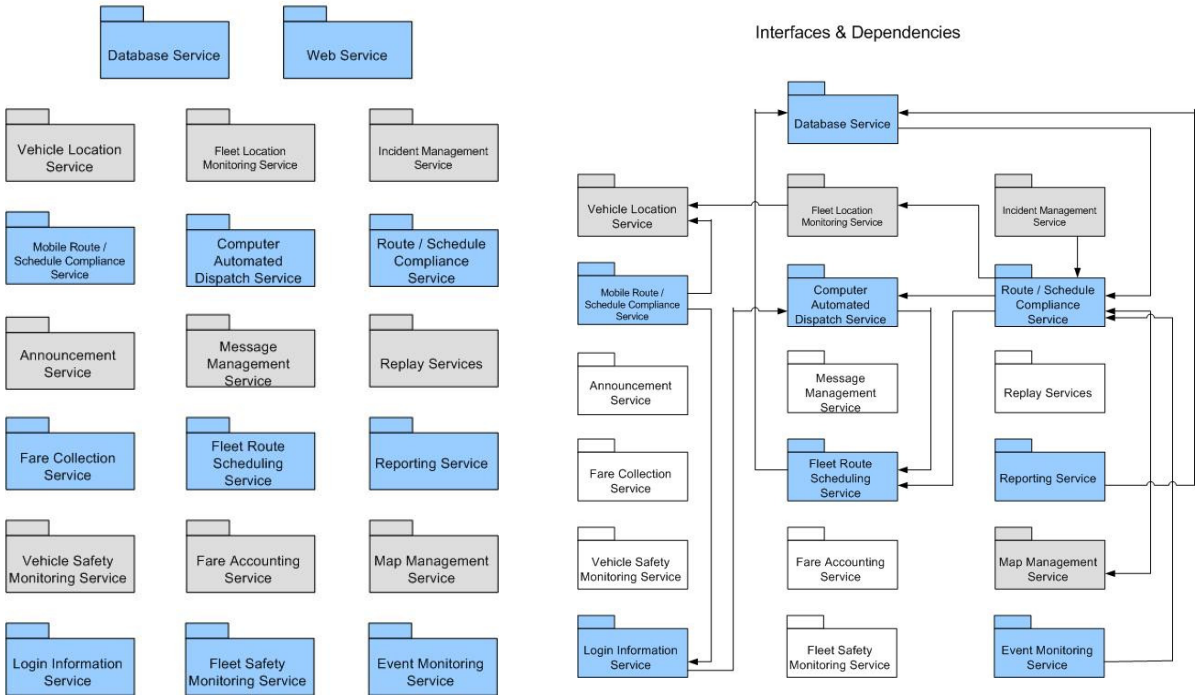
The central control centre operators should be provided with dual screen option to perform analysis and event tracking in a way that data collaboration can be done.

The system should additionally provide ad-hoc query based interface for the analysts to perform complex analysis. The system should provide functions to create new analysis / reports based on the user needs and same shall become part of the user report bin.

General Software Architecture for AJL



Typical View for Software Components and Interfaces



15.4. CCS Communication Links:

The Service provider shall provide a reliable method of verifying the integrity of the data and programme files sent from the CCS to the AFCS and the correct reception of data uploads received from the AFCS at the CCS.

15.5. CCS hardware and software

The proposed set up should be capable to cater to meet the needs of a Real time Transit system involving more than 1000 buses, 1000 STT's, 1000 access gates and 1,000,000 transactions per day. Additionally, the system should be capable of expanding and scaling with additional deployment of hardware and necessary amendments to software for operations of 3 to 5 times the sizing stated above.

The vendor is expected to deploy state of art monitoring screen systems for monitoring various activities like vehicles, exceptions, late & early buses, etc on a video wall kind of setting.

15.6. Software:

The software deployed shall include a package consisting of computer operating system software, diagnostic, testing, development and support software and AFCS application software, including software to manage and safeguard security keys for SC and software for the generation and modification of report contents and presentation.

Security features shall be incorporated to prevent tampering with any data, programs, or other facilities of the CCS.

The service provider shall provide an inventory / asset management and tracking tools for the management of all devices supplied.

All computer software documentation for the CCS including workstations shall be provided by the service provider. Necessary technical information, concerning hardware, software and firmware including system architecture, shall be provided to AJL by the service provider upon full deployment of the system.

15.6.1. Configuration Data Management

Configuration data (CD) is the information transmitted from CCS to each Bus AFCS which as a minimum package shall contain

1. Equipment Operations parameters,
2. Fare table, SC configuration parameters (Add Value etc.,)
3. Black list
4. Application updates

The CCS shall be capable of checking and handling exception, missing, duplicate, delayed and fabricated data. The system shall be able to track the continuity of all types of data of system devices in case the above problems occur.

The CD Parameters shall have an effective date and time which may be any time in the future such that they are applied with immediate effect. If the effective date and time is set in the future, these parameters shall take effect on the specified date and time without further operator intervention. All the devices in the AFCS shall be able to handle at least one version of future CD parameters. However, there shall only be one current CD parameter list in the system and the system shall ensure that only one version of parameters takes effect in the system at any one time. Once a version of the CD parameters is deployed, it shall be locked to prevent any modification.

The system shall allow only authorized staff to maintain parameters. A facility shall be provided as part of the CCS whereby the operational parameters can be modified and once verified and AUTHORISED can be transmitted to the AFC Systems for implementation at a date and time to be specified. It shall be possible to use back-up media to allow for change in operational parameters to be implemented in the event that the communication links are down.

Parameters shall be grouped in files according to the different levels of validation required such that, for example, device over ride parameters can be sent separately from fare tables and without the same level of validation. The system shall allow CD parameters to be highly directive to the level of individual devices by the device ID and IP address

The CD parameters shall be communication media independent, Shall be able to be sent via depot WAN / WiFi or via GPRS connections so that items like blacklist / action list can be sent immediately.

The Configuration database shall be provided with a reporting tool to produce reports of various parameters and groups of parameters set on the system, sub-systems and devices

15.7. Data Storage

The design of the database system shall be arranged to keep track of all valid SC in circulation. This information shall aid in reporting any abnormal usage of stored value or trips and in providing refunds for corrupted SC.

The database system shall satisfy the following requirements:

Full-function RDBMS to Support complicated data structure will be deployed, multi-user, multiprocessing, large capacity operation, Offer data integration, data recovery and security, Support parallel processing, Provide disk mirroring functions , Authority control shall be independent of that of the operating system and Offer multilevel security management of database.

Data storage capacity shall be sufficient to maintain six months transaction data available on line for ad hoc report generation and other investigations. The volume of data to be calculated for this requirement shall assume 1,000,000 transactions per day. The database shall be easily expandable to handle another 1 million transactions a day minimum.

To maximise the utilization of the disk space of the system, system data shall undergo a regular housekeeping process. Housekeeping shall cover the files created by the CCS and the files relative to each subsystem. Any outdated or invalid files shall be archived. Duplicated records in the database and records where only the latest data need to be retained shall be merged and archived.

The system shall be able to backup and recover data according to different modes and periods of backup required based on their criticality and data volume. The system shall have the functionality to backup and recover all key data (usage data, system data) and files.

15.8. CCS Security

The Central Control System shall implement security systems to manage equipment authentication and administer the control over authority given to administrators of the operating system and others. It shall also manage the operating authority of SC devices at Depots.

A stand alone, highly protected, access control system shall control access to every part of the system to the authorised personnel

For more elaborate requirements on ITMS security standards requirement, refer to ITMS security section.

15.9. Clock Management

The Central Control System shall obtain the standard date and time and synchronize its clock automatically from AJL or its designated master clock system. The CCS shall synchronize its clock at least once every 15 minutes. If the clock is not synchronous to the standard time, the correction shall be completed in one second.

The clock information shall be downloaded to all AFC equipments and all SC devices. When the clock time of an AFC component or SC device is different to the downloaded clock time, the device’s clock shall be corrected automatically to the downloaded clock time. The correction shall not happen with the trip of a bus to avoid incomplete transactions due to time variation.

When the hosts or the SC devices of the system are restarted, they shall be able to download or receive the clock data and synchronize their own clock automatically.

15.10. Reports

The system as a minimum shall be delivered with capability to generate following reports, a comprehensive list of reports further than the mentioned below shall be finalized at the time of requirement finalization stage:

a. Conductor / Driver Login reports for Day, week, month

b. Non Compliance issues of different driver / conductors for the shift

c. Trip summary.

d. Bus Equipment Fault Summary

e. Hourly Bus Usage Summary

f. Total Commuters and revenue per Route, per Bus, per shift

g. Revenues collected on same bus, same route, same trips by different Conductors

h. ROI route wise, trip wise, shift wise

i. Passengers boarding bus at a Bus stop – Time of day

j. Daily pass usage and its ROI for the passes validated

k. Student pass usage and the Cost of the subsidy that has to be refunded by Government- daily, weekly, monthly, yearly.

l. Origin – Destination

m. SC Bus Usage By Route Number

n. Test Card Usage by route Number

o. AJL employees usage of services

p. Bus Service Disruption

q. En-route Ticket Inspector Summary

r. Boarding and Alighting Service

s. Boarding and Alighting statistics

t. Passenger KMS analysis per trip configurable by the user

u. Bus Rides and Revenue Statistics By Fare Code

v. Bus Equipment Transactions

w. Bus Faults Per Transactions Processed By Device

x. Cash Revenues as per AJL MIS

y. SCs not used for the week , Month

z. Bus Equipment Fault Summary

aa. Half-Hourly Bus Usage Summary

bb. Total Patronage

cc. Bus Patronage And Revenue Statistics By Service Number

dd. Bus Service Revenue And Passenger Statistics Summary

ee. Boarding Ride Bus Stop

ff. Summary Of Bus Passengers Boarding By Service Number

gg. System, Depot, Devices, STT CD parameters set current and pending future CD sets

hh. Transfer Statistics

The above state reports are only indicative, actual list could be exhaustive based on AJL's requirements.

The Service provider shall provide AJL a GRAPHICAL DASHBOARD to have visual view of all / some key reports/ parameters enabling quick decision making.

15.11. Data centre

The data centre shall be secured access control and operated by authorised personnel only.

The data centre shall have adequate band width and established DMZ for WEB casting

The data centre shall be capable of handling a minimum of 500 transaction packets per second

The data centre shall have fault tolerant UPS system powering all the equipments. (The service provider has to recommend if any changes are required).

The data centre shall have back up power from a diesel generator set.

The data centre shall be protected from fire hazards by gas based fire extinguisher system.

The data centre servers shall work on reliable / stable / multi tasking operating systems

The data centre shall have reliable communication, processing and web hosting software packages for the transit management application

All field data shall be synchronized with and from CCC in real-time.

16. ITMS Security Management

The service provider shall be required to implement industry standard security protocols to ensure that all activities within the ITMS framework are coordinated through secure modes.

The ITMS shall essentially offer security at Application level, Device level, Interface / communication Level and Data. All applications shall be operated using secure login systems and same shall be extended to any form of communications including Card Management, Cash till management, Card Validators, Bus driver console, CCC devices etc.

The service provider shall implement suitable protocols like AES (Advanced Encryption Standard) with 128 Bit Key length to ensure highest level of operational integrity for card management and other operations. The file types and command length should be based on ISO/IEC 7816 Standard. The encryption and secure messaging scheme for authentication, data encryption and message authentication coding (MACing) shall allow high flexibility and reliability.

All field devices shall communicate to CCC over encrypted VPN Tunnel.

17. Financial Management System

17.1. Central Accounting System

The central Accounting system shall consist of following sub-systems/ modules.

- Payments Accounting Module/Sub-system (Treasury section)
- Receipts Accounting Module/Sub-System (Treasury section)
- Daily Receipts and payments
- Cross Verification (Daily Sheets) (Accounting Section).
- Bank Reconciliation.
- Investment Module.
- Liability module.
- Suspense (Advances) Module.

17.2. Receipts Accounting Module (RAM)

The receipt of funds shall be a centralized/de-centralized activity in AJL and shall be managed by central financial management system. The receipts from the transportation and allied activities of AJL shall be managed in the central accounting system. The RAM shall cover the following major activities:

- Receipt of Funds (Treasury Section)
- Posting in Daily Sheets
- Consolidation into Classified Registers
- Cross Check with Collection Centres and Treasury Section
- Trial Balance (monthly & annually)

17.3. Payment Accounting Module (PAM)

Payment accounting module shall allow both centralized and de-centralized activity and hence payments shall be made from the Central Accounts Department as well from the other operational centres as shall be decided by AJL. The payees shall be able to put up their requests by means of credit bill or Performa invoice to the department, which has placed an order for supplies or for the work or service provided. After due verification of the supplies received or the work done, the concerned department shall prepare 'payment-memo', debits it to the appropriate budget-head and then the head of that department or the person who has budget-drawing powers shall signs it. This payment-memo is then sent to the Central Accounts Department. The PAM shall cover the following major activities: -

- Real-time settlement system including electronic fund transfer
- Payment Memo Approval
- Payment
- Daily-sheet preparation/posting
- Posting in Bills/Budget Ledgers
- Consolidation into Classified Register

- Trial Balance Preparation

17.4. Daily Receipts and Payments Cross-tally

Central accounting system shall provide facility for Item-wise receipts and payment statements (Daily-Sheets) under RAM and PAM every day. These shall be prepared on the basis of paid vouchers and receipt challans, while bank- book (Journal) and cash-book (Journal) shall be written as and when challans are received along with cash or cheques or voucher is paid in cash or by cheque.

In order to ensure correctness of daily accounts (receipts and payments) the cash and bankbooks (or main journal) shall be cross-tallied with the sum of the budget item-wise daily statement. If the gross receipts & payments of the day (as per journals) tallies with the sum of the daily sheet, the accounts are presumed to be correct.

18. Training Room and Test AFCS

18.1. Scope:

The service provider shall set up training and test facility adequate for training all staff of the service provider. Each staff member shall be deployed on the front end or at CCS centre only after certification jointly by Service provider and AJL.

Service provider shall create training manuals and other necessary aids to ensure the perpetual need for training as and when required for AJL/RSRTC/Operator Personnel is required.

18.2. Handover/Takeover

The service provider shall ensure that AJL is sufficiently trained and skills are continuously upgraded to ensure complete takeover of the system at completion of the contractual agreement.

The service provider is required to impart training and necessary tools in-order to take-up operations whenever necessary. Service provider shall six months before the end of the contractual period go through a process of hand-over take-over with AJL personnel's and act in supervisory role for smooth take over.

18.3. Functional Requirements:

The devices and sub-systems shall be connected to the test CCS by an independent LAN / WAN that will permit the exchange of controls and data in a similar manner to that implemented for AFCS equipment installed in Depots.

The service provider shall ensure that this equipment operate with cards which carry test keys and does not create an opportunity for fraudulent encoding of SC in the production system.

18.4. Use as Prototype

The service provider shall develop software applications / manufacture equipment or accessories at the AFCS training and testing facility for testing as a prototype. Deployment will follow after joint evaluation by AJL and the service provider.

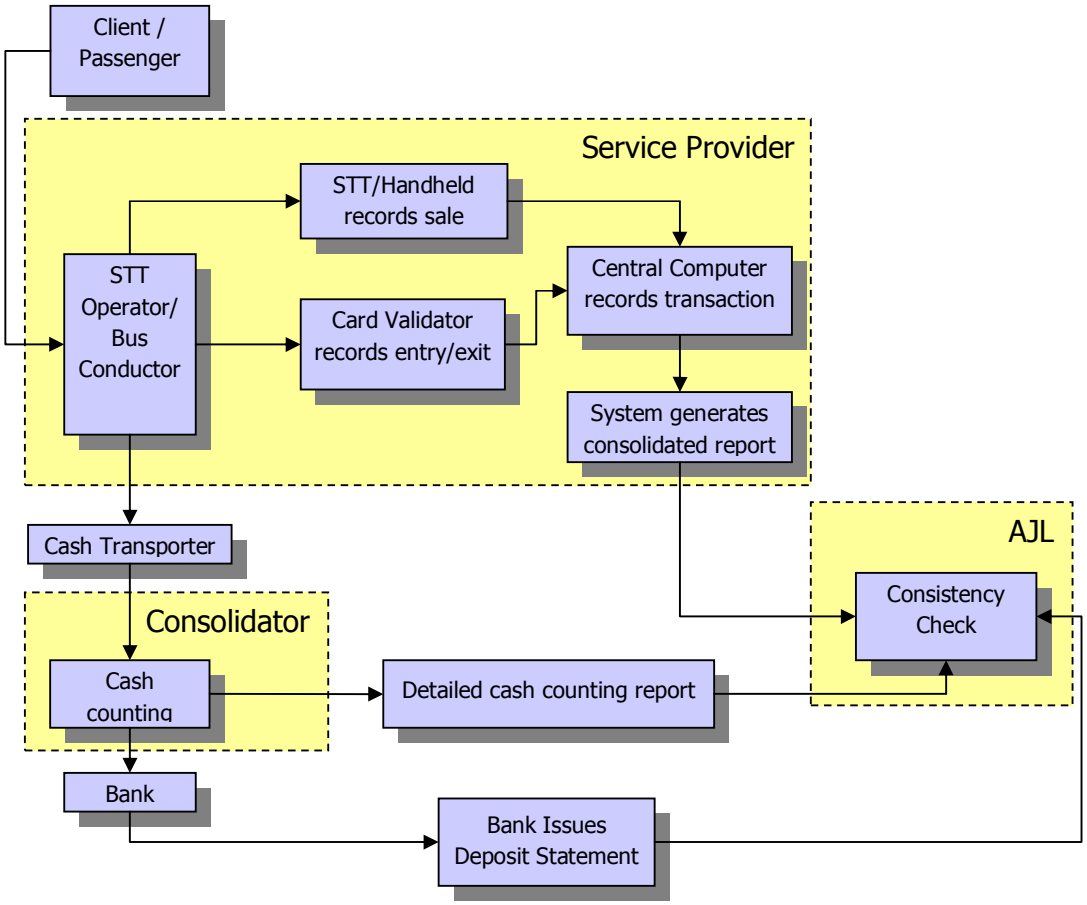
19. Cash Handling

19.1. Requirements:

Cash collected on station and on bus shall be transported by vendor. The same shall be counted at AJL authorized consolidator against the bus conductor / Bus station STT operator / Bus terminal cashier. Cash collection from bus station and bus terminals shall be the responsibility of vendor. Cash collection from bus conductors at bus terminals, to be handed over to the secure cash transporters, shall be the responsibility of the service provider.

This information along with all the transaction details for the shift shall be transferred to the back end where the data is analysed for shift operational reports and cross verification by AJL of transactions against cash receipts at consolidator.

The figure below gives the process outline for cash handling and transaction data verification by AJL.



20. Off- Site Sales

The Service provider shall facilitate the issue of SC from other locations, which are not included as paid services as part of this contract, but are extensions of AJL operations, which may include commercial kiosks within the Terminal concourses and outside agencies. Equipment and procedures for the issue and topping-up of SC from outlets, which are external agencies to AJL or the AFSC service provider, shall be proposed for the AJL's

approval. Such procedures shall ensure that the movement of SC to external agency locations takes place prior to the encoding of any value to ensure security of revenue.

The service provider shall assist AJL in discussions with potential operators of off site sales outlets for the AJL SC with a view to achieving compatibility of equipment systems and reliable and secure capture of off site transaction records.

21. Non-Transit Service Providers

The service provider shall advise the AJL on provisions in the SC data structure to permit non-transit service providers to process the AJL SC for e-purse transactions and implement clearing and settlement process for the same.

The service provider shall assist AJL in preparing technical and operating specifications to be provided to non-transit service providers for them to follow to ensure compatibility with the AJL's AFCS.

The service provider shall assist the AJL in discussions with potential non-transit service providers with a view to achieving harmonisation and compatibility of equipment systems and the rules for use of SC.

22. Human Resource Management

There shall be a Project manager as a representative of the service provider at the time of implementation followed by an Operations manager, employed as the head of operations by the service provider, after the start of commercial operations. Project manager shall act as the single point of contact and shall be responsible for all the deliverables of this agreement. The operations manager shall be the single point of contact with AJL after the start of operations.

22.1. Central Control System

All the manpower required for Central Control System including the hardware maintenance shall be arranged by the service provider. Required database, SW and report experts shall be organised by the service provider. The proposal must include the costs for these operational personnel. Any shortcomings shall be made good by service provider, and if needed, deploy additional personnel to ensure satisfactory services.

22.2. Commercial Operations and Maintenance - Bus stations, Bus Terminals, Buses

Resources for Station ticket terminals & Bus Fare Collection, including manning the stations are to be provided by the service provider. The service provider shall provide cost of such services on annuity basis, payable monthly. This should be clearly indicated in the financial proposal. The personnel shall be responsible for the smooth functioning of the STT, validation equipment and its connectivity to CCS. They shall attend to the problems with STTs, card validation equipment, PIS equipment, connectivity problems and any other hardware related at stations and bus terminals. Service provider personnel shall also attend to any problem with equipment on bus installed by it. Service provider shall place its personnel on bus to manage fare collection using handheld ticketing unit.

23. AFCS Disaster Recovery Centre / Business Continuity Plan

The service provider has to setup a disaster recovery centre to mitigate risk of any outages on account of Hardware /Software / Connectivity failure. The service provider has to

guarantee up time of 99.9%. In event of the primary AFCS control centre failure, the system should automatically route the AFCS field equipments to alternate/DRC site for service continuity. The DRC site shall be housed at a different geographical location in-order to have business continuity in place. The site for DRC shall be provided by AJL in consultation with the service provider. The service provider shall provide reporting access to DRC server to AJL authorized officials to cross verify day end reports sent from primary control centre. The DRC is expected to be on auto pilot mode in normal circumstances and act as a primary source of reporting need for AJL.

The Service provider shall implement DRC at location other than CCC. The DRC shall be implemented based on the above specifications of AJL.

The service provider shall necessarily shift ITMS operations to DRC from primary control centre for a minimum period of one day in a month to ascertain DRC is always capable of taking over the operations from primary controllers in event of a failure.

Service provider shall implement DRC with 45 Days of Start of Implementation.

24. Lead Time

The successful bidder will initiate the Project activities within a maximum period of 2 weeks from the time of award of this Request Order for full/part pf the Project. The successful bidder shall have to set up a pilot demonstration at one bus station with respect to Automated Fare Collection System and Passenger information system. They shall also install and demonstrate Automated Vehicle Location system on one bus. This pilot demonstration shall be done within 15 days of the receipt of LOI.

The project implementation shall be done in a period of Three months from the date LOI. The service provider shall give AJL a clear project implementation plan within 20 days after signing the service agreement, in consultation with and to the satisfaction of AJL. This plan shall include details of the project implementation team and benchmarks of delivery of equipment, installation of equipment, integration and setting up of the Central Control Centre.

Upon completing the set up, the service provider shall do a test run for the entire system, remove any shortcomings and resolve any bugs in hardware, software, communication network and Central control system and have the system ready for commercial operations one month from the completion of set up.

25. Application and System Audit

AJL shall appoint a third party auditor capable of auditing IT systems envisaged as part of ITMS implementation. The service provider shall be required to provide necessary information to the third party auditor to facilitate testing and audit of hardware, software and processes related to ITMS.

26. Scope of Pilot Implementation

Automatic Fare Collection System

26.1. Bus Station

- Ticketing Terminal (POS) with Software, Smart Card / Coin Interface, Receipt Printer

- Bus Card Validator at Flap Barriers
- Local LAN at Bus Station
- Usage of valid and invalid card demonstration

26.2. Central Computer System

- Central Computer System
- One System with the required software will be installed at Bus Station
- Card Initialization and Card Personalization Devices
- Upload data from Field equipments to Central computer system
- Processing the data and generating the reports
- Backend Hardware and Software Setup (Not needed on actual configuration systems)
- Issuing of Single Journey Tickets (Tokens) against Cash and Smart Card
- Reports and MIS will be generated

26.3. GPS Based Fleet Management System

- GPS Unit will be fitted in 1-2 Vehicle
- Backend Hardware and Software Setup
- System can be accessed over the internet
- MIS & Reports will be generated
- Passenger Information System
- Two Destination Sign and one Next Bus Stop Sign with Announcement
- Backend Hardware and Software Setup

26.4. Public Information System

- Bus Stop Display Boards will be fitted at one bus stop and they will fetch the information over GPRS currently
- System can be accessed over the internet
- MIS & Reports will be generated
- Financial Accounting System

26.5. Financial Management System Demonstration

26.6. Vehicle Dispatch & Scheduling System

27. Change Management Procedure

Any changes having technical or commercial implications will have to be mutually agreed upon in advance, prior to making the change. In case of situations, that the impact is not dependent on one or both parties' agreement, the revised commercials will be effective from the date of impact.

For avoidance of doubt, the parties expressly agree that

- Change Request shall not be effective and binding unless agreed in writing and signed by both AJL and Service Provider.
- The payment of any additional cost agreed under a Change Request shall be in addition to the payments agreed upon under this Agreement.
- Upon a Change Request becoming effective, the Project Schedule shall automatically stand adjusted by the additional time required for implementing the Change Request.

28. Computerised Call Management System

The service provider shall be required to implement service call management system capable of logging service request call within the enterprise of AJL ITMS. The system shall uniquely identify all calls by way of assigning ticket numbers and resolution procedure. This system shall provide AJL a computerised log of all incidents logged as part of the ITMS operations. The system should further provide analytical reports to evaluate problem areas and escalation system to ensure problems are reported properly and resolved.

29. Project Management Requirements

The scope, duration and size of this project require the service provider to create an effective Project Management team to assure the success of the work. The following Project Management elements shall be incorporated as a key component of the project.

29.1. Project Management Personnel

The Service Provider shall establish a Project Manager, who shall be highly responsive to the needs of AJL as required in these Specifications and subject to AJL acceptance. The Project Manager shall coordinate design and engineering activities and provide a technical liaison to AJL. This person shall be highly competent and fully qualified in all aspects of the System. Where support is provided from individuals or groups outside the project, the support personnel shall be under the control of the Project Manager during the period of support, and support groups shall be required to provide support as their highest priority. An organization structure that diffuses responsibility and does not require that resources be assigned at management request is not responsive to this Contract and will not be accepted or tolerated by AJL. To accomplish the above, the Service Provider shall assign a permanent Project Manager and Senior Technical Staff Member (STSM), subject to AJL approval and assure compliance with the project management requirements of the Specifications and Agreement.

Project Manager

The Project Manager shall be identified to AJL, within seven (7) days after notice to proceed.

Authority

The Project Manager shall have the contracting authority to issue and approve purchase orders and to contractually bind the Service Provider. The Project Manager shall have the authority to assign and schedule Service Provider to perform all of the Work required by this Agreement, and act as Service Provider's representative for dispute resolution.

Responsibility

The Project Manager shall provide a single point of contact for AJL to resolve all issues related to this Contract. The Project Manager shall be responsible for directing all Subservice providers' designs and work.

Project Understanding

The Project Manager shall have a full and complete understanding of the Contract Documents and site conditions sufficiently to provide adequate direction for coordination of work.

Qualifications

The Project Manager shall have at least 10 years experience in design and management of Transit ITS projects, with at least one completed project assignment for a fleet in excess of 200 vehicles. AJL shall be the sole determinant of the suitability of the proposed Project Manager's qualifications. AJL reserves the right to have the service provider replace the Project Manager if qualifications are not met.

Availability to the Project

The Project Manager shall be available to AJL on a twenty-four hour per day, seven days per week basis and shall respond promptly to any reasonable AJL request. Coverage of this requirement by any alternates shall be subject to approval by AJL.

The Project Manager shall be on site during all significant project events, as necessary to facilitate meetings, project activities, and information flow between the service provider and AJL, and as requested by AJL.

Senior Technical Staff Member

The STSM shall be available to the Project within seven days after LOI issuance.

Responsibility

The STSM shall act as a technical resource for coordinating all system design and implementation issues. The STSM shall check each technical submittal prior to its being sent to AJL for approval. The STSM shall all technology related work to assure quality.

Project Understanding

The STSM shall have a complete understanding of the technical requirements of the Contract Documents and site conditions sufficiently to provide design direction and to determine compliance of the service provider's design submittals and work.

Qualifications

The STSM shall be a Professional Engineer, who qualifies as acceptable to AJL. The STSM will have a minimum of 10 years of experience, including three years or equivalent experience in coordinating engineering and administrative support activities for ITS. AJL shall be the sole determinant of the suitability of the proposed STSM's qualifications. AJL reserves the right to have the service provider replace the STSM if these qualifications are not met.

Availability to the Project

The STSM shall be on site during all significant project events, as necessary to facilitate meetings, project activities, and information flow between the service provider and AJL, and as requested by AJL. In no case shall it be considered acceptable for the STSM to be on site less than ten (10) days per month. Coverage of this requirement by any alternates shall be subject to approval by AJL.

29.2. Project Meetings

Attendance

The service provider's Project Manager and STSM shall attend Progress Meetings held weekly.

The service provider's Project Manager and STSM shall conduct a Project Kickoff Meeting with AJL stakeholders, Steering Committee, and the AJL Consultant Manager.

The service provider's Project Manager and STSM shall attend additional meetings, as requested by AJL and the AJL Consultant pursuant to the coordination of the Work.

Location

Progress meetings shall be held at AJL facilities unless otherwise specifically approved by AJL. Other meetings shall be held at a mutually agreeable location, conducive to the topic of the meeting. For any project meetings conducted by conference call, service provider shall, at the service provider's expense, provide a conference call-in number.

Meeting Minutes

The service provider shall prepare minutes for each meeting, unless specifically instructed otherwise by AJL. The Service provider shall prepare the minutes and distribute them to the attendees within two working days after the meeting. Minutes of Meetings shall include names of attendees, significant proceedings, decisions, unresolved issues, and a list of information requested by AJL. The minutes shall be of sufficient detail to record any decisions made at the meeting and any follow-up actions required. The minutes shall include a summary of open action items, the party responsible for each, scheduled date for the action, and the respective resolution. Service provider shall provide a rolling project report, adding and deleting items as necessary.

Agenda

The Service provider shall prepare the agenda for each progress meeting. The Service provider shall provide a draft agenda to AJL at least one week prior to each meeting and request that AJL add any additional items. Review of the previous meeting minutes and any outstanding action items shall be included on the agenda for each meeting. Each progress meeting agenda shall also include the item, "Additional AJL Issues and Concerns."

29.3. Schedule

Detailed Contract Schedule

The detailed contract schedule shall be a critical-path-method schedule constructed using Microsoft Project or other software application acceptable to AJL. The detailed contract schedule shall show each activity, including interface activities, for completion of the Work, and shall be properly ordered and sequenced. Six printed copies and one electronic copy of the detailed contract schedule shall be submitted for AJL approval within 15 calendar days after LOI.

Task Duration Limits

The detailed contract schedule shall be sufficiently detailed to preclude the use of activity durations greater than 15 working days. Activity durations shall include allowances for lost time and inefficiencies.

Task Designations

Each task designation shall delineate the phase or stage of the work, and the component of the work such as design, submittal, submittal review, procurement, fabrication, delivery, installation, and testing.

Task Details

Where appropriate to the understanding of the task, additional details shall be provided, such as:

- A clear description of the activity, including its location.
- The duration expressed in full working days.
- A responsibility code denoting the Service provider, a subservice provider, AJL, a government Agency, or a utility performing the activity.
- The quantity of material, in units.
- The integer percent complete representing the installed progress.
- The actual start and finish dates when applicable.
- Unless specifically agreed to in writing by AJL, Service provider is responsible for all Work to complete any task.

Critical Path

The detailed contract schedule shall show a clear and definable critical path(s) for the Work and each specified milestone. Requirements and events which impose limitations, as well as dates and milestones which constrain the time, shall be clearly identified. Days of float time shall be shown. Items that require AJL inputs and response shall be clearly identified.

Updates

The detailed schedule shall be updated every 15 days to show actual progress and changes to projected dates. Each update shall include a narrative describing the changes made since the last update. Each update shall be provided to AJL within 5 working days from the month end cut-off date and submitted with each invoice. hardcopies and one electronic copy shall be provided.

Four-Week Rolling Schedules

The four-week rolling schedule shall show one week of historical information and two weeks of planned activities in support of and consistent with the detailed contract schedule.

Format

The four-week rolling schedule shall be presented as a chart with tasks along the left side and days along the top of the table. A shaded bar or “X” entered in the chart shall indicate work to be performed on each day for that task.

Task Detail

The level of detail shown on the four-week rolling schedule shall be greater than the level shown on the detailed contract schedule. In general, it shall show the Work to be done each day and the location(s) where the work will be done and by whom. Work done in buses and other vehicles shall be identifiable uniquely or as part of an easily traceable group of buses. Work that requires AJL input or response shall be clearly identified.

Updates

The four-week rolling schedule shall be updated weekly and provided to AJL by the end of the first day of the active week. Printed copies and one electronic copy shall be provided.

29.4. Submittals

General

This Section describes general requirements and procedures for preparing and transmitting information to AJL for review, acceptance or approval.

Scheduling of Submittals

Transmit submittals sufficiently in advance of Contract requirements to permit at least Ten (10) calendar days for review, checking and appropriate response by AJL or designated representative.

Transmittal Forms

Furnish the transmittal forms sequentially numbered and clearly indicate the Project Name;

Project Number; Date; "To:"; "From:"; names of subservice providers, suppliers or manufacturers; required Specification references; category and type of submittal; purpose; description; distribution record (for transmittals and submittals); and signature of transmitter.

Checking of Submittals

Examine and check the submittal for accuracy, completeness, and compliance with the Contract before delivery to AJL. Stamp and sign each submittal with the statement reading as follows: "Having checked this submission, we certify that it conforms to the requirements of the Contract in all respects, except as otherwise indicated". By reviewing, approving, and submitting a submittal, the Service provider has determined and verified materials, field measurements, and field implementation criteria related thereto, and has checked and coordinated the information contained within such submittals with the requirements of the work and the Contract.

Record of Submittals

Maintain at the worksite a complete up-to-date, organized file of all past and current submittals including an index and locating system, which identifies the status of each submission.

- Assign sequential numbers to each submittal.
- Assign revisions levels (A, B, C, etc.) to all re-submittals. Assign new transmittal numbers and cross references to previous submittals.

Electronic Format

All submittals shall be provided in electronic format as well as hardcopy. File formats for electronic copies shall be subject to AJL approval. Current version, industry prevalent software shall be utilized for preparing all submittals. Drawings shall be submitted in AutoCAD format. Drawings or studies involving geographic information shall be submitted in a format that can be viewed by GIS software.

AJL Review

AJL and/or designated representative will review and approve or take other appropriate action upon the Service provider's submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract requirements. AJL's action will be taken as to cause no delay in the Work or in the activities of the Service provider. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of Equipment or systems, all of which remain the responsibility of the Service provider as required by the Contract. AJL's or designated representative's review will not constitute approval of safety precautions or, unless specifically stated by AJL or designated representative of any construction means, methods, techniques, sequences, or procedures. AJL's or designated

representative's approval of a specific item does not indicate approval of an entire assembly of which the item is a component.

AJL Review Stamp

All Service provider's submittals will be stamped by AJL or designated representative with (a) the date of receipt, and (b) one of the following dispositions (see Review Stamp Exhibit hereafter), and two sets will be returned to the Service provider. (Submittals for record of the Authority will not be returned).

1. APPROVED: Work may proceed, provided it complies with the Contract. The approval of shop drawings and samples is not construed;
    a. As permitting any departure from the Contract requirements;
    b. As relieving the Service provider of responsibility for errors and omissions, including details, dimensions, and quantity of materials; or
    c. As approving departures from details furnished by the Contracting Officer or designated representative.
2. APPROVED AS NOTED (Correct and resubmit): Work may proceed, provided:
    a. It complies with the Contract as well as the corrections on the submittals, and the Service provider resubmits within fifteen (7) days corrected copies of the specifications, working drawings, or miscellaneous submittals for final approval; and
    b. Work performed by the Service provider prior to receiving final approval will be at the Service provider's risk.

DISAPPROVED (Revise and Resubmit): Work not recognized as being able to proceed.

Revise submittal in accordance with notations thereon, and resubmit without delay. Handle re-submittals in the same manner as first submittals, except designated with suffix A, B, C, etc. to indicate 1st, 2nd, or 3rd re-submittals. On re-submittals, direct specific attention in writing on re-submitted documents, working drawings, samples, mock-ups, sample panels, or miscellaneous submittals to revisions other than the corrections required on previous submissions. Make corrections required by AJL or designated representative.

Actions Following Review

If APPROVED, each of the documents will be identified as having received such approval by being so stamped and dated. Documents stamped DISAPPROVED and with required corrections shown will be returned to the Service provider for correction and re-submittal.

Service provider will be returned one copy of each document duly stamped, signed, and dated.

29.5. Drawings

Quality of Drawings

The Service provider shall be responsible for accuracy and correctness of all drawings. The Service provider's Project Manager and STSM shall initial each drawing after checking it, indicating that it complies with all requirements of this Specification and accurately reflects intended or actual field conditions.

The Service provider shall check each drawing for:

• Conformance with Contract Documents

• Logical grouping and arrangement

- Accuracy
- Legibility
- Neatness
- Line Quality
- Lettering Quality
- Reproduction Quality
- Completeness

Product Data Submittals

Quality of Submittals

A submittal shall be prepared for each major piece of material or Equipment that the Service provider intends to furnish. These submittals shall be known as "Product Submittals". Copies of each product submittal shall be furnished. Each submittal shall be accompanied by a cover letter with reference number, signed by the Project Manager. Each submittal shall contain a list of any parameters for which the submitted products do not meet the Specifications and a description of how these changes will affect system design. Each submittal shall contain a description of any changes in design or products that the submitted products will cause.

Content

Each submittal shall contain sufficient information to determine that the System Component complies with the Specifications and Agreement. Actual values of all specified parameters shall be listed; a simple statement that the product complies will not be sufficient. Each product submittal shall be accompanied by Engineering Drawings necessary to determine the product's applicability to AJL ITMS design. All closely related products shall be submitted as a single package. When pre-printed material is used in a submittal, the specific model number and options to be furnished shall be clearly identified. Standard data sheets can be used, subject to the following:

- Modify manufacturer's standard and/or schematic drawings to delete information, which is not applicable to the Contract. Supplement standard information with additional information applicable to this contract.
- Modify manufacturer's standards, diagrams, schedules, performance charts, illustrations, calculations, and other descriptive data to delete information, which is not applicable to the contract. Indicate dimensions, clearances, performance characteristics, capacities, and any other diagrams, as applicable.
- Modify installation, erection, application, and placing instructions to delete information, which is not applicable to the Contract.

Test Procedures

The Service provider shall submit copies of each test procedure description, accompanied by a cover letter with reference number.

Submittal Organization

Each test procedure description shall include the following information:

- A statement of the purpose of the tests.
- The location, date(s) and time(s) tests will be performed.

- The quantity of units to be tested.
- The test equipment to be used, identified by manufacturer and model number.
- A step by step description of the procedure to be performed.
- Specific pass/fail criteria for each test.
- A sample of the form(s) to be used to record test data. Each test form shall include the following information:
    a. Test title
    b. The manufacturer, model number and calibration date of each piece of test equipment.
    c. A table to record individual readings taken and inspections performed for each unit tested, identified by the serial number of the unit tested.
    d. An indication that the unit has passed or failed each individual test.
    e. A line for signature of the technician performing the test and date.
    f. A line for signature of the Project Manager and date.
    g. A line for signature of AJL representative witnessing the test.
    h. Drawings illustrating the configuration of the Equipment tested and all test equipment utilized.

29.6. Test Results

Content

One original and copies of the results of each test shall be submitted. The original of the test results shall contain the original test forms filled out by the technician(s) performing the tests and original signatures. Test forms shall be filled out in ink and no erasures shall be made. Errors shall be crossed out with a single line and initialed by the person making the correction. Each set of test results shall be accompanied by a cover letter with reference number.

Organization

Each set of test results shall include the following information:

- The complete test procedures used.
- The completed, signed test forms.
- A summary of the test, indicating quantity tested, quantity that failed, quantities that failed each individual procedure, and a statement of the remedy to be applied for failed units.

29.7. AS-BUILT DOCUMENTATION

As-built documentation shall include drawings and software documentation. As-built documentation shall include:

- Design and Installation Plans of the On-Bus Subsystems for each Bus and Vehicle Type
- Design and Installation Plans of the BUS STATION Subsystem
- Design and Installation Plans of the Central Control Centre Subsystem
- Design and Installation Plans of the LAN and WAN.

- Design and Installation Plans of the Scheduling & Dispatch Subsystem
- Design and Installation Plans of the communication Subsystem
- Design and Installation Plans of the AVLS Subsystem
- Design and Installation Plans of the Passenger Information Subsystem

As-Built Drawings

Drawings Content

As-built drawings shall provide a permanent record of the finished system. Each design document that was submitted for approval shall be modified to reflect the actual installed condition and shall become an as-built drawing. These drawings shall be supplemented with site specific information. Where a document is typical for more than one location, the locations shall be explicitly listed on the drawing & documents:

- All nomenclature and labels shall correspond to the actual labels on installed Equipment.
- Each connection to each piece of equipment, junction box, or terminal block shall be identified by function and color code.
- All dimensions, physical details, connections, and other information pertinent to system diagnostics, maintenance or troubleshooting shall be shown.

Organization of Drawings

All drawings pertaining to a subject shall be submitted as a package with cover sheet, index, and symbols and abbreviations table. A master index of as-built drawings shall be provided that organizes the drawings by package and drawing number.

Submittal of Drawings

A pre-final version of the as-built drawings shall be submitted to AJL prior to maintenance training and prior to acceptance testing. The Service provider shall correct any inaccuracies and add plans to correct any deficiencies as identified by AJL or as necessary to document changes made during acceptance testing. Final versions of as-built drawings shall be submitted within two weeks after acceptance testing or maintenance training, whichever is later.

As Built Software Documentation

The Service provider shall provide all "Computer Software" and "Data" to allow AJL to fully maintain and update all "Applications Software". "Computer Software" and "Data" shall include as-built versions of ITMS:

- Software Requirements Specification;
- Software Version Description Document, or equivalent;
- All "batch" or equivalent files, and all object libraries and "include" files, for editing, compiling, linking, and installing application software. Corresponding instructions shall also be provided;
- All files required to define, allocate, and load the database, and any other data files required to define, configure, load, or operate the system. Corresponding instructions shall also be provided.

Copies of each document shall be submitted in electronic form (CD-ROM, DVD ROM or other media and in a format that is accessible by AJL) in order for it to be incorporated into AJL's Electronic Document Library.

The Service provider shall be required to provide source code and sufficient documentation including source code documentation in Escrow to permit modification of the delivered software without the necessity of contacting the Service provider in the event the Service provider is unwilling or unable to undertake such modifications. Proposers shall explain, in detail, the documentation to be supplied, provide samples, and guarantee of content with proposals.

29.8. PROJECT CLOSEOUT

Project closeout shall include an initial survey and a final survey.

Initial Survey

Pre-Requisites

Prior to requesting an initial closeout survey of ITMS, the following conditions shall have been met:

- The systems acceptance test has been conducted.
- The Service provider has listed those items yet to be completed or corrected and has submitted a detailed plan of action and schedule for completion of the outstanding items.
- The Service provider has submitted special guarantees, warranties, maintenance agreements, final certifications and similar documents.
- The Service provider has obtained and submitted operating certificates, if required, final inspection and test certificates, and similar releases enabling full and unrestricted use of the work.
- The Service provider has submitted operations and maintenance manuals and final as-built documentation.
- The Service provider has delivered tools, including special tools, test equipment, standby equipment, and similar items.

Conducting the Survey

Upon receipt of the request for initial survey, AJL will prepare a listing of any additional work items that are outstanding.

29.9. Final Survey

Pre-Requisites

The Service provider shall perform the Work necessary to complete and correct the items noted during the initial survey. The Service provider shall provide written notice to AJL that the items have been completed and ITMS is ready for final survey.

Conducting the Survey

Upon receipt of the notice, AJL will schedule a final survey to verify that all of the Work items have been completed satisfactorily.

29.10. SYSTEM DELIVERABLES

ITMS deliverables provided by the Service provider shall include all work required to deliver the System and System Components in accordance with this Specification and Agreement.

Manuals, Training, and Training Tools

The Service provider shall provide manuals, training, and training tools for the proper operation, maintenance, and repair of ITMS equipments and applications. Delivery of the manuals, training, and training tools shall be accomplished per the Service provider-provided and AJL-approved schedule.

Design Submittals

The Service provider shall provide preliminary and final design submittal packages, as well as individual design details for all elements specified herein. The Service provider shall provide detailed cut-over plans and procedures. All submittals shall be in both hardcopy and electronic format.

As Built Documentation

The Service provider shall provide As Built Documentation. Delivery of the As Built documentation shall be accomplished per the Service provider-provided and AJL-approved schedule. All as-built documentation shall be provided in both hardcopy and in electronic format.

Monthly Status Reports

Monthly status reports shall be submitted to AJL on the 7th of each month detailing the previous month's progress. The monthly status report shall contain a description of the activities and accomplishments, an updated schedule showing the progress, and any issues or concerns. Service provider format is acceptable.

Test Plans/Procedures and Test Results

Service provider shall provide all Test Plans/Procedures required for the ITMS project and the Test Results. The Test Plans/Procedures and Test Results format shall be submitted to AJL for approval.

29.11. System Support

Prior to System Acceptance

Support for the maintenance and operation of installed ITMS subsystems shall be provided after incremental acceptance and prior to System Acceptance. It is AJL's intent to begin operating ITMS after completion of the first incremental acceptance.

- Support shall be provided on-site at AJL during testing and cut-over of Equipment on a continuous basis.
- Support for in-service ITMS Equipment shall be provided twenty-four hours per day, seven days per week. A request by AJL for assistance shall be answered within SLA parameters as required by AJL.

Post System Acceptance

The Service provider shall provide end-to-end support during the contract period of 5 years.

29.12. QUALITY ASSURANCE

The Service provider shall submit to AJL within 15 days of the Notice To Proceed (NTP) or LOI a comprehensive Quality Assurance (QA) Program Plan designed to ensure the quality of all activities, including design, purchasing, inspection, handling, assembly, fabrication, testing, storage, shipping, and warranty/repair work. The plan shall describe all quality control procedures of the Service provider and any sub-suppliers. The Service provider shall conduct regular inspections in accordance with guidelines defined by the QA Program Plan. Performance of any manufacturing or construction work shall not commence until the Quality Assurance and Control Plan relating to such Work has been accepted by AJL. The Service provider shall update the QA Program Plan as necessary, when any deficiencies in the Work are discovered.

AJL will, at its own discretion, perform QA monitoring of work done under this Contract, including monitoring of the Service provider's or Subservice provider's QA activities. Upon

request, the Service provider's QA records shall be made available to AJL for inspection. Such QA activities performed (or not performed) by AJL shall not reduce nor alter the Service provider's QA responsibilities or its obligation to meet the requirements of this document.

At any time during the manufacturing process, AJL may choose to visit the Service provider's facility or a Subservice provider's facility during normal working hours to audit the manufacturing and quality control processes.

29.13. Technical Documents

A key component of the ITMS implementation is the accuracy and value of all deliverables. The technical documents prepared by the Service provider during the course of this project will include design reports, installation drawings, test plans, test reports, progress reports, and other technical memos. A review process shall be established by the Service provider to assure all System Components are checked for accuracy, correctness, uniformity, and compliance with standards of practice.
The various tiers of the review cycle are detailed below:

- The Service provider's Project Manager shall review project products for adherence to the standards of care common to the profession.
- The Service provider's Project Manager shall be responsible for assigning qualified professionals to check all work products for accuracy, uniformity, and clarity. Responsibility for interface, control, and integration of disciplines into a uniform and coordinated document set is also included in this role.
- The Senior Technical Staff Member and individuals assigned as technical discipline leaders within the Service provider team shall provide another review. The reviews shall be initiated by the Project Manager and shall focus on a technical discipline review of selected project products.
- AJL will provide a final review. This review will occur only after the Service provider's internal review cycles have been completed. When review comments result in a change to any technical document, the Service provider's Project Manager shall be responsible for change coordination and document back-check. In addition to the formal and on-going quality control review, timely coordination meetings with all project staff shall be held to provide for interdisciplinary liaison and interface coordination. These meetings shall be utilized to schedule work assignments, identify and resolve coordination issues, and track progress associated with any problems encountered and their resolution.

Document Management

Due to the substantial amount of documentation involved in this project, Service provider shall work with AJL's Project Manager to develop and submit to AJL a Documentation Management System. The Document Management System shall include an organized electronic library of all versions of all submittals and a log of the contents. This shall be completed within 30 days after Notice to Proceed. AJL and the Service provider shall mutually agree on a documentation file index that shall provide an overall methodology for referencing documents generated in the course of the project. File type and organization of electronic versions of documentation shall be mutually agreed on by AJL and Service provider. All subsequent documentation shall be referenced to the file index, and Service provider and AJL shall mutually maintain the file index in current condition so as to show all documents that have been generated and their status.

Documentation in the DMS should be readily available to AJL's Project Manager, designated personnel within the Service provider's organization, ITMS Consultant, and AJL-designated additional personnel. Security methods shall be available to restrict access by others.

System Components

The Service provider shall conduct regular inspections and audits in accordance with guidelines defined by the QA Program Plan. The Service provider's Project Manager shall establish a quality assurance process and be responsible for assigning qualified professionals to check all system Components for compliance with the ITMS Specifications and consistency in production quality. This quality assurance program shall supplement the formal testing requirements to verify that:

- Prior to installation, all System Components delivered by the Service provider shall pass rigorous screening that complies with standards of practice.
- All delivered System Components shall be tested after installation. Testing shall include hardware and software interface tests.

Manufactured Products

The Service provider shall utilize products manufactured by companies that utilize formal, documented quality assurance practices that meet or exceed the standard of care established by the industry. The Service provider shall proactively monitor each supplier's quality system. Quality systems that conform to ISO/CMMI practices are preferred.

29.14. MANUALS

This section identifies the manuals to be provided to support training and give on-going documentation needed for AJL staff to manage, maintain, and expand the ITMS.

GENERAL REQUIREMENTS FOR MANUALS

Development Process

The Service provider shall prepare a complete plan for providing the manuals described herein.

The plan shall include at least the following:

- Service provider shall submit for approval the outline of each manual as a part of the Preliminary Design Review.
- Service provider shall develop and submit a draft version of each manual submitted with the Final Design Review.
- Service provider shall deliver one complete set of manuals prior to the start of the acceptance testing.
- Service provider shall incorporate information gathered during installation and acceptance testing, throughout the maintenance and warranty period into the manuals for the updated and final submittals.

Content

Manuals shall contain all of the information material required to support the area of activity.

All Manuals

All manuals shall:

- Be in concise form, with minimal redundancy.
- Be organized in clear, logical fashion, and indexed and tabbed for rapid access.

- Be in English.
- Be written for comprehension by persons with a high school education.
- Contain table of definitions for all abbreviations and special terms.

All Operations Manuals

All operations manuals shall contain:

- Instructions on navigation from one function to another.
- The meaning of all display symbols and labels.
- The meaning and interpretation of all alarms and messages, and the recommended remedial action for each alarm and message.
- A reference card defining each cursor command, control key, and status indication.

All Equipment Maintenance Manuals

All Equipment maintenance manuals shall contain:

- A section on safety procedures and precautions necessary to prevent damage to equipment, injury to personnel, and unsafe operational conditions.
- A section with an overview of the test equipment and tools necessary to troubleshoot and maintain ITMS equipments.
- Wiring diagrams and physical layout drawings for all equipment
- A section addressing the intervals and procedures for all preventive maintenance including level adjustments and cleaning.

Medium and Formats for Delivery

Hardcopy

The Service provider shall deliver to AJL the manuals for all sub-systems in hardcopy form, with appropriate binding and labeling.

- Manuals shall be designed for continuous, long-term service in a maintenance shop or vehicle environment.
- Manuals shall lie flat when opened
- Pages shall be printed on both sides.
- Manuals shall permit adding and replacing pages.
- Covers shall be oil, water, and wear resistant.

Softcopy

In addition, the Service provider shall deliver to AJL in electronic form all manuals and manuals components that are developed by the Service provider, or by vendors in response to the requirements of this Contract.

- The electronic form shall consist of two good copies of each final manual on an electronic storage medium (CD-ROM or other approved media).
- The format of the storage medium shall be one that is widely used and easily available to AJL.
- The manuals shall be stored as MS Word, Portable Document File, or other AJL-approved format.

BUS OPERATORS MANUAL

The Service provider shall provide a manual for bus operators. The manual shall provide a clear and concise description of operator interface with ITMS and related AJL operating policies and procedures. It shall include:

- Overview of the ITMS System
- On-Bus Subsystem Description
- How the Bus Operators are to perform all communications and bus fleet management functions provided at the Bus Driver Console.
- Procedures for wireless calls.
- Procedures for sending canned messages and receiving text messages.
- Procedures for SOS.
- Procedures for logon/logoff.
- Help guide for functional failures and problems.
- Pocket size Reference Card.

SUPERVISOR MANUAL

The Service provider shall provide a manual for supervisors. The manual shall provide a clear and concise description of supervisor interface with ITMS and related AJL operating policies and procedures. It shall include:

- Overview of the ITMS System
- On-Bus Subsystem Overview
- Procedures for radio calls using mobile and portable radios.
- Procedures for sending and receiving text messages.
- How the supervisors are to perform all communications and bus fleet management functions provided at the CCC.
- Help guide for functional failures and problems

DISPATCH CENTER DISPATCHER AND SUPERVISOR MANUAL

The Service provider shall provide a manual for Dispatch Center dispatch supervisor, dispatchers, and supervisors performing dispatch duties. The manual shall provide a clear and concise description of the ITMS operator interface for Dispatch Center dispatchers and supervisors for all console functions provided, including normal call, messaging, and schedule and route adherence functions. It shall include:

- ITMS Overview
- On-Bus Subsystem Overview
- CAD Subsystem Description
- How the dispatchers and supervisors are to perform all communications and bus fleet management functions provided at the dispatcher consoles.
- How the Dispatch Supervisor can assign work assignments.
- How to manage work assignments, the work queue, and incident reports at their various stages.

- How to perform rudimentary remedial action for limited-scope failures, including: shutting down and restarting console processors, shutting down and restarting console-based software processes, and replacing printer paper, restarting printers, restarting printer queues.

Depot SUBSYSTEM USER MANUAL

The Service provider shall provide a manual for users of the depot Subsystem. The manual shall provide a clear and concise description of the ITMS operator interface for depot Subsystem users for all console functions provided, including:

- ITMS Overview
- Depot Subsystem Description
- On-Bus Subsystem Overview
- How the Depot Subsystem functions are provided.
- How the Depot Subsystem users are to perform all communications and fleet management functions provided at the depot Subsystem workstations.
- How to perform rudimentary remedial action for limited-scope failures, including: shutting down and restarting console processors, shutting down and restarting console-based software processes, and replacing printer paper, restarting printers, restarting printer queues.

VEHICLE COMMUNICATIONS MAINTENANCE MANUAL

The manual shall provide a logical structure and organization for the maintenance manuals provided by the manufacturers of the On-Bus subsystem communication equipment, and shall provide any necessary information to supplement them to fulfill the requirements of this section. Manuals shall include the following topics, as a minimum:

- ITMS Overview,
- On-Bus Subsystem Description
- Communication Subsystem Description
- How to identify the source of a problem to a specific replaceable element. Provide a logical procedure for isolation a problem.
- How to replace an element. Provide detailed procedure, or reference to a manufacturer manual detailed procedure, for removal and replacement of each on bus subsystem element. This shall include setting and verification of options, programming, and testing of the replaced unit and associated equipment to verify correct On-Bus subsystem operation.
- Verification of correct operation of the repaired on-bus subsystem.

FIXED COMMUNICATIONS MAINTENANCE MANUAL

The fixed communications and radio subsystem maintenance manual shall complement the maintenance training provided. The manual shall supplement the maintenance manuals provided by the manufacturers of the fixed radio subsystem equipment. The manual shall provide a logical structure and organization for the maintenance manuals provided by the manufacturers of the On-Bus subsystem radio equipment, and shall provide any necessary information to supplement them to fulfill the requirements of this section. Manuals shall include the following topics, as a minimum:

- ITMS Overview

- Radio Subsystem Functional Description
- System diagnostic procedures
- Identification of the source of a problem to a specific replaceable element, provide a logical procedures for isolating a problem. Provide a description of self-diagnostic features and system administrator reports.
- How to replace an element. Contain detailed procedure, or reference to a manufacturer manual detailed procedure, for removal and replacement of each fixed radio subsystem element.
- Verification of correct operation of the repaired radio subsystem. Include instructions for setting and verification of options, programming, and testing of the replaced unit and associated equipment to verify correct operation.

This requirement shall apply only if the Service provider provides the fixed data radio system.

IN-VEHICLE EQUIPMENT MAINTENANCE MANUAL

The manual shall focus on guiding technicians in verifying the presence of a failure and performing first echelon replacements. Manuals shall include the following topics, as a minimum:

- ITMS Overview
- On-Bus Subsystem Functional Description
- Identification of the source of a problem to a specific replaceable element, provide a logical procedures for isolating a problem. Provide a description of self-diagnostic features.
- How to replace an element. Contain detailed procedure, or reference to a manufacturer manual detailed procedure, for removal and replacement, and verification of first echelon replaceable elements.
- Verification of correct operation of the repaired On-Bus Subsystem. Include instructions for setting and verification of options, programming, and testing of the replaced unit and associated equipment to verify correct operation.

AFCS OPERATIONS ANALYST MANUAL

The Service provider shall provide a manual for handling and analyzing AFC data. It shall provide a clear description of features of bus AFC equipment characteristics, data capture methods, data anomalies and their detection, data management processes, and database organization. Provide instructions on database maintenance, data anomalies correction, using data management tools, and AFC report.

DISPATCH CENTER AND Depot WORKSTATION MAINTENANCE MANUAL

The manual shall focus on guiding technicians in identifying the source of a problem to a specific replaceable element, replacement of the element, and verification of correct operation of the repaired subsystem. Manuals shall include the following topics, as a minimum:

- ITMS Overview
- CAD Subsystem Functional Description
- Depot Subsystem Functional Description

- Identification of the source of a problem to a specific replaceable element, provide a logical procedures for isolating a problem. Provide a description of self-diagnostic features and reports.
- How to replace an element. Contain detailed procedure, or reference to a manufacturer manual detailed procedure, for removal and replacement or repair of an element.
- Verification of correct operation of the repaired ITMS Workstations and Dispatch Center equipment. Include instructions for setting and verification of options, programming, and testing of the repaired unit and associated equipment to verify correct operation.

COMPUTER SYSTEM ADMINISTRATOR MANUAL

The Service provider shall provide a system administrator's manual that provides a clear, organized description of all of the configurable computers of ITMS, the tools and procedures for managing their configuration, and for diagnosing their performance and problems. It shall contain at least the information described below.

29.15. Fleet Management Reporting

This section shall provide details on the standard reports that are automatically generated by ITMS and instructions on how to perform custom queries to generate ad-hoc reports.

ITMS Computer Configuration

The configuration section shall contain at least:

- A high level and detailed description of computer configurations and interfacing equipment at the Dispatch Center, bus depots, fixed communication site(s), mobile units, configuration of ITMS LAN/WAN logical and physical entities, and connections to AJL LAN/WAN.
- Description of operation of interfaces to connected systems (AJL LAN/WAN, Vehicle Health System, depot Subsystem.)
- A listing and functional description of software components for each computer.

Configuration Management and Operation

The Configuration Management and Operation section shall contain at least:

- Procedures and tools for defining ITMS users, function access and privileges, and console function assignments.
- Computer startup, interconnected systems communications restart, and shutdown procedures.
- Overview and details of procedures and tools for installing and verifying new software and rolling back old software for Dispatch Center, Computer Subsystem, Depot Subsystem, fixed communication site(s), and mobile units.
- Monitoring, maintaining, archiving, and restoring the ITMS database and DMZ.
- Maintaining, updating AVLS and AFC databases.
- Procedures for modifying the Route and Stop databases.
- Procedures for importing updated route and schedule databases.
- Monitoring, analysis, and optimization of computer/LAN/WAN performance

Manual shall include procedure for configuring ITMS for each separate fleet, setting access privileges for AJL personnel and AJL service provider personnel.

29.16. Diagnostics and Troubleshooting

The Diagnostics and troubleshooting section shall contain at least the following:

- Equipment and operating system error messages and diagnostics, with remedial action for each.
- Tools and procedure to troubleshoot equipment and software problems on all ITMS equipment
- Procedures to manage and diagnose interfaces with connected systems.

29.17. COMPUTER SOFTWARE MAINTENANCE MANUAL

The Service provider shall provide a programmer's guide for each of the programmable computers in ITMS. For each, the guide shall:

- Provide an overview of software organization.
- Define external interfacing data format, semantics, and protocols.
- Define internal modules, data interfaces, tasking, considerations for timing, priorities, and resource use.
- Provide complete source code listings.
- Identify and detail use of programming and database maintenance tools used to create the software.
- Include complete documentation of non-application components such as operating system, communications handlers, database, and report generators.
- Detail the procedures for building and managing software configuration.
- Describe the metrics embedded in ITMS to evaluate its performance.
- Identify the error conditions detected within the software, and the messages or indications for those conditions.
- Identify parameters used to adjust ITMS operation

Annexure – Current ITS Hardware Assets List

Servers

SN.	Type/ Part No.	Description	Qty
1	B13-AA	Sun Fire X4150 x64 Rack-Mount Server 1U base chassis including embedded LOM, 4x 10/100/1000 Ethernet ports, 5x USB 2.0 ports and 1 AC Power Supply. This system can support up to 2 Intel(R) Xeon (R) processors, 16 memoryDIMMs, 1 DVD drive, 8 disk drives,,3PCI-Express card and a second AC powersupply unit	2
	6388A	Internal SAS Drive Cable Kit for Sun Fire X4150 server.	2
	6327A	Redundant hot-swappable AC 650W power supply unit for Sun Fire X4140 and X4150 x64 servers	2
	SG-PCIE8SAS-I-Z	Sun StorageTek (TM) 8-Port internal SAS PCI-Express LSI 3081E Host Bus Adapter with RAID 0, 1, 5, 1E support	2
	RA-SS2CF-146G10K	146GB 10K RPM 2.5" SAS hard disk drive with Marlin bracket	6
	6326A	Slide rail kit for Sun Fire X4140/X4240/X4440/X4150/X4450 server	2
	6380A	4GB Memory Kit with 4x1GB PC2-5300 667 MHz ECC Fully Buffered DDR2 DIMM for Sun Fire X4150 and X4450 server	8
	6391A	Quad-Core Intel(R) Xeon(R) E5410 processor (2x6MB L2, 2.33 GHz, 1333 MHz FSB, 80W) for Sun Fire X4150	2
	6323A	DVD+/- RW drive for sunfire X4150/X4250/X4450/X4140/X4240/X4440 SERVER	2
		Sun OS 10 Media Kit	2

PIS Server

SN.	Description	Type/ Part No.	Qty
1	**HP Server with 300GBX3 HDD with red 5**		
	Proliant DL360G6 Entry Model / (1) QuadCore Intel Xeon E5504 Processor (2GHz, 80 Watts,) / 4MB (1X4MB) Level 3 cache / 4 GB (2X2 GB) Standard; PC3--10600E (DDR3-1333) Unbuffered DIMMs/ HP NC382i Dual Port Multifunction Gigabit Server Adapter / HP Smart Array P410i zero memory Module/460W Hot Plug Power Supply, redundant RFK Std	504637-371(2Nos.)	2 sets
	HP 2GB 2Rx8 PC3-10600E-9 Kit for G6 models of ML150/350/370 DL160/180/360/380 BL 460/490	500670-B21(4Nos.)	

	HP 300GB 3G SAS 10K SFF DP ENT HDD	492620-B21 (6Nos.)	
	HP 460W CS HE Power Supply Kit	503296-B21 (2 Nos.)	
	HP SL 12.7mm SATA DVD-RW Optical kit for DL360 G6	532068-B21(2Nos.)	
	HP 512MB P-Series Cache Upgrade Factory integrated	462967-B21(2 Nos.)	
	HP 3y CP 4H 24x7 HW Proliant DL360	U4497E (2 Nos.)	
2	**HP Server with 146GBX3 HDD with rad 5**		
	Proliant DL360G6 Entry Model / (1) QuadCore Intel Xeon E5504 Processor (2GHz, 80 Watts,) / 4MB (1X4MB) Level 3 cache / 4 GB (2X2 GB) Standard; PC3--10600E (DDR3-1333) Unbuffered DIMMs/ HP NC382i Dual Port Multifunction Gigabit Server Adapter / HP Smart Array P410i zero memory Module/460W Hot Plug Power Supply, redundant RFK Std	504637-371(1No.)	1Set
	HP 2GB 2Rx8 PC3-10600E-9 Kit for G6 models of ML150/350/370 DL160/180/360/380 BL 460/490	500670-B21(2Nos.)	
	HP 146GB 3G SAS 10K SFF SP HDD	431958-B21(3Nos.)	
	HP 460W CS HE Power Supply Kit	503296-B21(1No.)	
	HP SL 12.7mm SATA DVD-RW Optical kit for DL360 G6	532068-B21(1Nos.)	
	HP 512MB P-Series Cache Upgrade Factory integrated	462967-B21(1 Nos.)	
	HP 3y CP 4H 24x7 HW Proliant DL360	U4497E (1Nos.)	

Server Operating System

SN.		Item Name & Description	Qty
	Description	**License Level /Type**	**Qty**
1	Oracle Database Standard Edition One(Perpetual Term)	Full Use- Processor Based	**2**
2	Unit ATS	One Year	**2**
3	Media Kit		
	Scope of Oracle Annual Technical Support (ATS) :-		
	End User will get access right to Oracle Metalink site (metalink.oracle.com) with TAR raising facility.		

	Via Metalink, End User will get the patches for the supported Oracle products on need basis		
	On need basis, version update software and patches for the above mentioned supported products can be downloaded directly by End User from the Oracle's eDelivery website: edelivery.oracle.com at no additional cost as and when released by Oracle India.		
	This Contract will give End User unlimited telephonic and email support as and when required during working days.		
	This support would be provided during workings hours on working days. For 24*7*365 support we have Web Support Centre. (We shall share mail/phone access details for this, subsequent to your order).		

POS Specifications

POS	
Processor	Intel Dual Core E2200 @ 2.40 Ghz
RAM	1 GB
Hard disk	160 GB
Cabinet	HCL
Monitor	HCL
Keyboard & Mouse	HCL
POS Server	
Processor	Intel Core 2 Duo E7200 @ 2.53 Ghz
RAM	2 GB
Hard disk	160 GB
Cabinet	HCL
Monitor	Not Provided
Keyboard & Mouse	Not Provided

Operating System

Sr. No.	Computer Description	O.S.
	STT Computers	

	STT Computers	CENTOS 5
	Control centre computers	XP professional
	Kaizen server	Windows 2003 server
	Application Server	solaris 10
	Database Server	Oracle Standard edition one

Router & Security Appliances

SN.	Description	Type/ Part No.
1	**Cisco Router**	
	1841 Security Bundle,Adv.Security,64FL/256DR	CISCO1841-SEC/K9
	1-Port Serial WAN Interface Card	WIC-1T=
	V.35 Cable, DTE, Male, 10 Feet	CAB-V35MT=
	CD for SDM software	ROUTER-SDM-CD
	1 Year Standard Support	CON-SMBS-C1841SEC
2	**Cisco Switch**	
	Catalyst 2960 24 10/100/1000, 4 T/SFP LAN Base Image	WS-C2960G-24TC-L
	1 Year Standard Support	CON-SMBS-C2960G2C
3	**Cisco ASA Firewall**	
	ASA 5510 Security Plus Appl with SW, HA, 2GE+3FE, 3DES/AES	ASA5510-SEC-BUN-K9
	ASA 5500 SSL VPN 10 Premium User License	ASA5500-SSL-10=
	SMARTNET 8X5XNBD ASA5510 Sec+ w/150 VPN Prs,5FE,3DES/AES	CON-SNT-AS1SBK9
4	**APW 42U Rack**	
	42Ux800x1000mm (with 100mm reducer) Server Rack with Fans - 4 Nos., set of castors - 1 No., power unit with 12 sockets of 5/15Amp - 1 No., power unit with 6 sockets of 5/15Amp - 1 No., hardware packet - 2 Nos., 2U Metal hoops - 16 Nos., Fixed shelves -	APW Rack